Natural Freshwater Springs of the Ballona Watershed: Historical Evidence, Flow Rates, and Contemporary Status

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This report supersedes two January 2026 draft reports on the same subject in their entirety. It is not a merge of their text: every factual statement, quotation, number, and conclusion below has been re-entered from the controlling primary-source record rather than inherited from the earlier drafts. The January 2026 drafts, and a subsequent multi-AI Truth Maintenance and Recursive Consensus (TARC) claim-by-claim review of them conducted August 6, 2026, are retained as provenance artifacts and carry no independent evidentiary authority in this edition.

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1. Executive Summary

This document is intended to function as an evidentiary reference rather than as an advocacy paper or policy recommendation.

The Ballona Creek watershed, draining approximately 130 square miles of the Santa Monica Mountains foothills and the Los Angeles coastal plain to Santa Monica Bay (Culver City), contained a documented population of natural freshwater springs and cienega-type seeps through the second half of the nineteenth century. This report assembles what the primary and agency record establishes about those features, their number, distribution, measured and reported flows, the unit conventions needed to read nineteenth-century measurements, their transformation under urbanization, and the sharply limited state of contemporary knowledge.

Principal findings. *(Confidence is listed throughout as Transcription confidence | Truth confidence; see §2.4.)*

- **Historical inventory: approximately 40–45 mapped spring features** for the 1850–1890 target period. *[Supported with Qualification;* `High | Moderate`*]* SCCWRP's historical-ecology report states in its executive summary that 45 springs were mapped and that 70% of them lay in the Santa Monica Mountain foothills; its regional sections enumerate 29 foothill and 11 Ballona Valley springs, a partial enumeration, since counts are given for only two of four analysis regions and Centinela Creek is treated outside the regional scheme; and the companion water-balance report refers to "at least 41" predevelopment springs (TR 671; TR 683). The four-feature difference between 45 and "at least 41" is unexplained in the published record and is not resolved here.
- **Historical wetlands: 174 mapped polygons totaling 14,149 acres (approximately 5,726 hectares) across twelve habitat types**, including tidal and salt-marsh classes (TR 671). *[Corrected;* `High | High`*]* The study does not attribute this acreage to spring discharge, and this report does not do so either.
- **The 2011 field investigation located 29 spring features**, comprising 6 natural springs in undeveloped parks on the urban fringe, 17 that appeared to be diverted through pipes and culverts, and 6 that could not be measured because of access constraints; the located features covered approximately 20% of the watershed's area (TR 683). *[Corrected;* `High | High`*]* These were not 29 active natural springs.
- **The average per-spring flow rate measured in July 2011 was 0.00057 m^3/s**, about 0.02 cubic feet per second, or approximately 13,000 gallons per day per measured spring (TR 683). *[Corrected;* `High | Moderate`*]* This is not a watershed total. (The report's abstract labels the same value an aggregate for the 29 located features; that characterization is internally erroneous, for the reasons set out in §7.2.)
- **A modeled July 2011 aggregate of approximately 260,000 gallons per day** follows from multiplying that average by TR 683's assumption that 20 springs were flowing (TR 683). *[Modeled/Scenario-Dependent;* `High | Low`*]* It is not a measured aggregate, not a census, and not a current or 2026 value, and it inherits the report's stated up-to-100% native-water uncertainty.
- **Springs supplied an estimated 2% of Ballona Creek runoff in July 2011**, a month in which no precipitation was recorded in the watershed and therefore no direct storm runoff occurred; the remaining 98% was attributed by deduction to imported water, excess landscape irrigation, and other human activity rather than to stormwater. Scaled across a year, the modeled spring share

of total annual runoff falls to about 0.5%, which the source describes as a baseflow contribution (TR 683). *[Supported with Qualification; `High | Low`]* Both are modeled partitions resting on an assumed spring count and on dry-season sampling of a subset of features, under a stated uncertainty of up to 100%.

- **Editorial decision: no preferred or headline historical watershed discharge value is published in this edition.** *[Not Established as a measured or preferred total]* The predevelopment water-balance scenario in TR 683 is discussed in technical methods terms only (§7.6), without a numeric output, because the underlying row treats a dry-season rate as an annual depth, is internally inconsistent between its spring-depth and runoff cells, rests on an assumed spring count, and carries up-to-100% uncertainty.
- **Current watershed spring discharge:** `n.a.` *[Insufficient Evidence]* No post-2011 watershed spring survey was identified in the course of this review, and no 2026 watershed total is published. No percentage decline is computed. Absence of an identified survey is a search outcome, not proof that none exists; agency confirmation is listed as a research priority in §10.
- **Nineteenth-century flow figures must be read under Hall's own unit convention.** Hall states that, where not otherwise specified, the inch used in his volume is one-fiftieth of a cubic foot per second (Hall 1888). *[Supported; `High | High`]* On that convention, one Hall inch equals 0.02 cfs, about 8.98 gallons per minute, or approximately 12,926 gallons per day, roughly 20% smaller than California's statutory miner's inch of 1.5 cubic feet per minute (California Water Code § 24).
- **Centinela Springs is the best-documented historical flow in the watershed.** Hall records that the springs "naturally flowed twenty to thirty miner's inches, and have recently been developed to yield something over fifty inches" (Hall 1888), that is, natural discharge of 0.40–0.60 cfs, approximately 259,000–388,000 gallons per day, and developed yield above 1.0 cfs, approximately more than 646,000 gallons per day. *[Supported / Derived Arithmetic; `High | Moderate`]* There is no natural surface discharge at the site today; no primary record establishing a cessation date was obtained.
- **Kuruvungna Village Springs is the only major named spring in the watershed for which a published contemporary discharge figure was located.** A 2005 City of Los Angeles Council record states 22,000–25,000 gallons per day (Los Angeles City Clerk); 2020 reporting gives roughly 22,000 gallons per day but supplies no measurement date or method (Alta Journal). A later claim of approximately 56,000 gallons per day could not be traced to a published source and is excluded. Historical discharge: `n.a.` 2026 discharge: `n.a.` The site is described as a living, flowing spring in a January 2026 institutional listing (Fowler Museum at UCLA).
- **Several sites treated in earlier accounts as springs are not springs.** The lake in Franklin Canyon originates in a reservoir begun in 1914 by William Mulholland and the Los Angeles Department of Water and Power to distribute water newly delivered from the Owens Valley; the managing agency's account does not attribute it to springs, and any spring contribution is `n.a.` (Mountains Recreation and Conservation Authority). The stream in UCLA's Mildred E. Mathias Botanical Garden is an engineered recirculating water feature, not a natural spring (UCLA Mathias Botanical Garden).

Scope boundary. This report addresses specific named freshwater springs and mapped spring features of the watershed's foothills and valley. It does not adjudicate the separate and actively contested question of whether the downstream Ballona estuary as a whole was historically freshwater-dominated or tidally influenced, a dispute in which SCCWRP's mapping-era interpretation and CDFW's current restoration-

baseline position diverge (§8.5). Nothing in this report should be read as evidence for either side of that dispute.

Rhetorical discipline. This edition does not use the vocabulary of collapse, extinction, or reckoning, and publishes no percentage decline. The one decline statement the record supports is the source's own: TR 683 estimates a greater-than-sevenfold decrease in per-spring dry-season flow rate between predevelopment conditions and 2011, on assumptions set out in §7.5 (TR 683).

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How to Read This Report

Three conventions govern the whole document and should be read before any number in it.

1. Statements about documents are separated from statements about the world. Throughout, "the source states X" is treated as a different proposition from "X is true." Where sources are internally inconsistent, the inconsistency is reported rather than resolved by editorial preference.

2. Transcription confidence is not truth confidence. Each significant claim carries a paired confidence reading, `transcription | truth`. Transcription confidence describes how certain it is that a source says what this report reports it as saying. Truth confidence describes how certain it is that the underlying real-world proposition holds. These routinely diverge. The clearest case in this record is the water-balance modeling of the Southern California Coastal Water Research Project (SCCWRP): its figures are transcribed with high confidence, while the report itself states that uncertainty in its native-water estimates is "likely up to 100%" (SCCWRP Technical Report 683). Those claims are marked `High | Low`.

3. Source-independence warning. Apparent agreement among sources in this subject area is frequently *not* independent corroboration. The record has effectively two upstream evidence nodes: William Hamilton Hall's 1888 state irrigation report (full text) and SCCWRP's 2011 pair of technical reports. SCCWRP's historical spring layer was compiled primarily from Hall's 1888 irrigation maps, and the companion water-balance report takes its predevelopment spring count from the historical-ecology report (TR 671; TR 683). Downstream summaries, popular histories, encyclopedic pages, and prior report drafts that appear to agree with each other generally trace back to one of these two nodes. Where two citations share an underlying node, this report says so rather than presenting the pair as mutual confirmation. Concurrence among reviewers or among derivative documents is likewise not treated as evidence.

Evidence-Status Legend (Axis A)

Status	Meaning
Supported	Directly stated or directly measured in a controlling source, with no material internal conflict.
Supported with Qualification	Supported, but only within a stated scope, period, method, or assumption that must travel with the claim.
Corrected	A claim that circulated in earlier accounts in a form the controlling source does not support; the corrected form is given here.
Contested-Unresolved	Two or more sources of comparable standing conflict, or a single source conflicts with itself, and the record does not discriminate.
Not Established	No controlling source supports the claim; it originated as inference, back-calculation, or unsourced assertion.
Insufficient Evidence	The claim may be true, but the underlying record was not obtained or does not state what is needed (units, date, method, page).
Superseded/Withdrawn	The claim was retracted or bibliographically disowned by its own authors and may not be used.

Evidence-Form Classification (Axis B)

Form	Meaning
Observed/Measured	An instrumented or volumetric field measurement, with a date.
Reported Historical Observation	A period observation recorded in a historical document, not reproducible today.
Derived Arithmetic	A unit conversion or algebraic restatement of a sourced value; adds no new information.
Modeled/Scenario-Dependent	An output that depends on stated assumptions (counts, rates, periods) rather than on measurement.
Interpretive Synthesis	This report's own reading across sources; carries no independent authority.
Locating Lead Only	A pointer useful for finding a primary record, never usable as support.

Source Hierarchy (Axis D)

Tier 1 comprises primary records and agency technical reports read directly: SCCWRP TR 671 and TR 683, Hall 1888, the California Water Code, California Office of Historic Preservation landmark records, the California State Archives land-grant list, municipal legislative records, Los Angeles County Public Works watershed planning documents, California Department of Fish and Wildlife (CDFW) project and reference materials, U.S. Geological Survey reports, and state groundwater plans. Tier 2 comprises institutional, museum, conservancy, and edited-journalism sources, used only where no Tier 1 record exists and flagged as such at the point of use. Tier 3 comprises tertiary aggregators, which are used in this edition for nothing at all: no encyclopedic page, children's reference page, or artificial-intelligence-generated summary supports any claim in this report, and several figures that circulated in earlier accounts are marked Insufficient Evidence precisely because a tertiary aggregator was their only traceable origin. Where Tier 1 and lower-tier sources conflict, Tier 1 controls.

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2. Scope, Methods, and Evidence Standards

2.1 Purpose and Audience

This edition is intended to be usable by hydrologists and engineers, agency staff, cultural-resource and tribal reviewers, restoration and watershed stakeholders, and informed general readers, without requiring access to the superseded January 2026 drafts or to the review record behind this rebuild. Every externally sourced factual statement carries an inline citation to the document that supports it. No conventional bibliography is provided; the inline citations are the citation apparatus.

2.2 What This Report Covers, and What It Does Not

In scope: the historical inventory, distribution, geologic setting, documented and reported flows, unit conventions, engineering transformation, and present documented status of natural freshwater springs and cienega-type seeps within the Ballona Creek watershed; the 2011 SCCWRP field investigation and

water-balance modeling insofar as they concern springs; and clearly labeled non-spring comparison sites that have previously been mistaken for springs.

Cross-referenced only, and deliberately not absorbed as substantive chapters: the engineered Ballona Freshwater Marsh and its permitting and governance record; groundwater-dependent-ecosystem acreage mapping under the state's groundwater sustainability framework; aquifer water-quality disputes; the restoration project's environmental-review litigation; and rancho partition and land-title litigation history. Each of these is a distinct subject with its own primary-source record, and each appears in §8.5 in a bounded form.

Out of scope entirely: adjudication of the downstream freshwater-versus-tidal historical-ecology dispute; any claim about biodiversity, endemism, or migratory-corridor function not directly supported by a cited source; and any watershed-scale present-day discharge total.

2.3 Method

The method was source re-entry rather than consolidation. The controlling record consists of primary and agency documents read directly, principally SCCWRP TR 671 and TR 683, Hall's 1888 state irrigation report, California Office of Historic Preservation landmark records, the California State Archives land-grant list, Los Angeles municipal and county records, CDFW project and reference materials, U.S. Geological Survey and state groundwater documents, and institutional site descriptions where no agency record exists. Values reported in earlier accounts were re-derived, and every conversion and aggregation presented here is reproduced in the calculation register at Appendix C. Where a figure could not be reproduced from a controlling source, it is marked `n.a.` rather than estimated.

Three rules were applied without exception. First, no number appears in this report without its status, evidence form, and, where the value is modeled, its governing assumption in the same passage, not only in an appendix. Second, no total is formed by summing values of different dates, methods, or scopes. Third, no tertiary aggregator supports any claim.

2.4 Confidence Pairs

Confidence is printed as `transcription | truth`. A `High | Low` reading is not a contradiction; it is the normal condition for modeled outputs in this record, and for period observations whose measurement basis cannot be reconstructed. Readers evaluating the report's reliability should attend to the second value.

2.5 Independence Flags in Practice

The following claim families share upstream evidence nodes and are therefore not mutually corroborating:

- The historical spring count, the historical wetland mapping, and the historical channel network all derive from the same SCCWRP mapping exercise, whose spring layer was compiled primarily from Hall's 1888 irrigation maps; TR 671 also notes that some features, notably certain ponds and springs, were documented by only one source (TR 671).
- TR 683's predevelopment spring count and predevelopment runoff rate are taken, respectively, from TR 671 and from Hall 1888, so the water-balance modeling is not independent of the historical mapping (TR 683).

- The two derivation routes that produce the same predevelopment discharge figure from TR 683's Table 3 are algebraically the same statement read twice, not two independent estimates (Appendix C, C.7).
- Popular and encyclopedic accounts of Centinela Springs, and both superseded January drafts, ultimately trace their nineteenth-century flow figures to Hall 1888.

2.6 Corrigenda Compliance

All statements in this report that depend on SCCWRP TR 671 have been checked against the author corrigenda dated April 20, 2026, appended to the currently served SCCWRP TR 671 PDF (TR 671, with author corrigenda). The corrigenda is authored in the names of the original report's authors, describes the corrections as an updated and superseding version, withdraws two historical claims, and flags several citations as unconfirmed. It is cited in this edition precisely as author corrigenda appended to the currently served SCCWRP PDF, and not as a separately catalogued technical report. Its consequences are itemized in Appendix D. Two are material to the narrative: the earthquake-series and three-consecutive-years-of-heavy-rain explanations for the Los Angeles River's course change are withdrawn (§3.2), and a 1904 newspaper passage previously used as a unit-conversion cross-check is bibliographically unconfirmed and is not relied upon here (§6.4).

2.7 Document Lineage: Period-Specific and Method-Specific Observations

The values in this report are not a time series. They were produced by different actors, for different purposes, at different scales, with incompatible methods. The table below exists to prevent them from being read as successive measurements of the same quantity.

Date	Document / observer	What was observed	Method and scale	Comparable to later values?
1888	Hall, state irrigation report (full text)	Natural and developed yields of named springs and cienega belts, in inches	Period field survey and reported utilizations; unit defined by the author as 1/50 cfs; Hall notes the measured inch was not uniform across southern California	No. Site-specific reported historical observation, not gauged discharge; no error statement
1850–1890 target period, mapped 2011	SCCWRP TR 671 (PDF)	Spring locations, wetland polygons, channel network	Retrospective geographic-information-system mapping, compiled largely from Hall's 1888 maps and other historical documents; no discharge measurement	No. A count and an extent, not a flow
2005	Los Angeles City Council record (PDF)	Kuruvungna site discharge, 22,000–25,000 gal/day	Statement in a municipal legislative record; measurement method not stated	No. Site-level, method-unstated
July 2011	SCCWRP TR 683 (PDF)	Average per-spring discharge at accessible	Dry-season field campaign using an electronic flow meter	Partially. Comparable only to other dry-

Date	Document / observer	What was observed	Method and scale	Comparable to later values?
		features; classification of 29 located features	where possible and a timed-volume bag test otherwise; sample composition not stated; approximately 20% of watershed area covered	season, subset-based spring measurements
c. 2023, unverified claim	Unpublished account attributed to a Kuruvungna site steward	Approximately 56,000 gal/day from one spring on the grounds	Claimed single-point volumetric observation; no published source located	No. Excluded from the report's findings as **Insufficient Evidence**
January 2026	Fowler Museum at UCLA	Site described as a living natural spring	Institutional description; qualitative	No. Presence, not discharge

The practical consequence is that this report contains no historical-to-current comparison of watershed discharge, because no two records in the table measure the same thing at the same scale.

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3. Watershed Historical and Geomorphic Setting

3.1 Drainage and Analytical Areas

The Ballona Creek *watershed* drains approximately 130 square miles (Culver City). *[Supported; `High | High`]* Hydrologic analyses in the SCCWRP water balance are computed not on that figure but on the 231 km² (89 mi²) *analytical basin* draining to the Sawtelle gauging station (TR 683). *[Supported; `High | High`]* Every depth-to-volume conversion in this report and in TR 683's own tables uses the 231 km² analytical basin, and figures computed on it are not watershed-wide in the 130-square-mile sense.

Long-term climatic context from the same source: mean precipitation of 409 mm/yr for water years 1938–2010, study-period runoff of 204 mm/yr, and evapotranspiration of approximately 393 mm/yr (TR 683). *[Supported; `High | Moderate`]*

TR 683's abstract characterizes the watershed runoff ratio as rising from 0.07 under predevelopment conditions to approximately 1.0 in the contemporary period. *[Contested-Unresolved; `High | Low`]* That contemporary endpoint is not consistent with the report's own Table 3, which prints 0.61 for 2011 and 0.77 for 2001, nor with its own reported means, whose ratio is about 0.50 (TR 683). The direction of change is not in doubt; the endpoint value should not be quoted bare.

3.2 Course History of the Los Angeles River

Prior to 1825 the Los Angeles River flowed through the Ballona watershed, and the river discharged into the Ballona as late as 1825 before shifting south (TR 671, with author corrigenda; CDFW-hosted geoarchaeological review). *[Corrected; `High | High`]* The CDFW-hosted review records that the river periodically switched its direction of discharge, at times flowing west through the Ballona and at other times south toward Long Beach; the earlier switches are undated in that account.

Two explanatory claims that circulated in earlier accounts are **Superseded/Withdrawn**: a preceding series of earthquakes, and three consecutive years of heavy rains beginning in 1825. The April 20, 2026 author corrigenda appended to the currently served SCCWRP TR 671 PDF withdraws both, while stating that heavy rains specifically in 1825, associated with the change of course, remain supported (TR 671, with author corrigenda). Neither withdrawn claim appears anywhere in this edition as support.

The avulsion matters to the springs question because TR 671 states that after the river's southward shift the inland marshes of the watershed, although hydrologically altered, did not dry up, and that fresh water springs flowing in a southwest direction sustained much of the inland marshland of Ballona Creek (TR 671). *[Supported as a source statement;* `High | Moderate`*]* That is a qualitative attribution. TR 671 attaches no discharge quantity to it, and no quantity is attached to it here; the hydrologic sufficiency of spring flow to sustain the marshes is not demonstrated in the source.

3.3 Historical Wetlands and Channel Network

SCCWRP mapped 174 unique historical wetland polygon features comprising 14,149 acres across twelve habitat classes for the 1850–1890 target period, with alkali meadow the largest class at 5,273 acres, followed by wet meadow at 3,336 acres, valley freshwater marsh at 1,356 acres, alkali flat at 1,284 acres, and salt or tidal marsh at 1,240 acres (TR 671). *[Supported;* `High | High`*]*

Two corrections apply to how this figure has been used. First, the 14,149-acre total is the mapped extent of historical wetlands of all types, including brackish, salt-marsh, and tidal-flat classes; it is not an area attributed by the study to spring discharge. *[Corrected]* Springs were one water source among several in this landscape, and no causal attribution of the acreage to springs appears in the source. Second, the correct metric equivalent of 14,149 acres is approximately **5,726 hectares**, not the 5,470 hectares printed as the table total in TR 671; the discrepancy traces to two mis-converted rows in that table, and the arithmetic is reproduced at Appendix C, C.9. *[Corrected;* `High | High`*]* Acreages, not hectares and not the published percentage shares, should be quoted from this table (Appendix C, C.10).

The same mapping records 232 miles (373 km) of historical stream channel, approximately 80% of it intermittent, and two perennial streams, Ballona Creek and Centinela Creek, with Centinela Creek described as spring-fed and approximately 4.5 miles (7.2 km) long, originating at Centinela Springs (TR 671). *[Supported;* `High | High`*]*

3.4 Human Occupation and Early Documentary Encounters

Archaeological Record

Occupation of the Ballona area began approximately 8,000 to 7,000 years ago, at the site designated CA-LAN-64 in the Westchester Hills, and was **episodic rather than continuous**. *[Corrected;* `High | High`*]* The CDFW-hosted geoarchaeological review records a brief lowland occupation of the Lincoln Gap alluvial fan (CA-LAN-62) around 6,500 years ago, then a documented gap in the archaeological record between roughly 6,000 and 4,500 years before present during which the Ballona was sparsely occupied if at all, renewal around 4,500 to 4,000 years ago, and a substantial settlement shift by about 1,000 years ago in which most lowland sites were abandoned in favor of a few (CDFW-hosted geoarchaeological review). Formulations asserting eight thousand years of continuous occupation are **Not Established** and are refuted in direction by this record. CA-LAN-62 is a Ballona lowland site and is not the Kuruvungna site; the two should not be conflated.

Early European Documentation and Village Identification

For Kuruvungna specifically, the 2005 City of Los Angeles record states that the springs were used as a natural fresh water source by the Tongva since 400 AD (Los Angeles City Clerk). *[Contested-Unresolved; `High | Low`]* Claims of use since the fifth century BC circulate elsewhere in derivative literature and are not supported by a source obtained for this review.

The 1769 Portolá expedition's diarist described arriving at a watering place with "two springs rising at the foot of a high tableland," and, at a village near that tableland, recorded that the people who came to the camp "had their little houses roofed with **grass**, the first" of that sort encountered, in the Brown translation as reproduced in a municipal technical study (City of Pasadena agenda attachment quoting Brown 2002). *[Corrected on wording; `High | High`]* Renderings of this passage as "roofed with tules" are inaccurate and are not used here.

The identification of that unnamed village or camp with Kuruvungna is **Contested-Unresolved**. *[`High | Low`]* The same municipal technical study states that the name of the village referenced near the August 4, 1769 camp is unknown and that it would have been located approximately three miles from the named village near Santa Monica, while the state landmark record for Serra Springs states that the Portolá expedition encamped at that spring (City of Pasadena agenda attachment; Office of Historic Preservation, Landmark 522). Both positions are recorded; neither is adopted.

Place Names and Demographic Data

Place-name variants for the lowland village complex are recorded in the same municipal study, Sa'anga, also referred to as Guaspet or Guashna, Saan, or Saa'anga and Waachnga in successive ethnographic literatures, without settled meanings (City of Pasadena agenda attachment). Glosses for Sa'angna and Pwinukipar: `n.a.` *[Insufficient Evidence]* Mission-period demographic figures that appeared in earlier drafts, including baptism counts and regional population estimates, are `n.a.` in this edition. *[Insufficient Evidence]*

3.5 Rancho-Era Land Units (Context; Litigation History Cross-Referenced Only)

Hall places the watershed's spring belts within the Mexican-era ranchos, so the land units are relevant nomenclature. Acreages and patent dates below are from the California Secretary of State and State Archives list of Spanish and Mexican land-grant maps prepared by the United States Surveyor General (California Secretary of State). *[Supported; `High | High`]* The archives field records a confirmee or patentee, not the original Mexican grantee, and the two must not be conflated.

Rancho (archives form)	Confirmee / patentee	Acres	U.S. patent date
Aguaje de la Centinella	B. Ávila	2,219.26	August 23, 1872
San Antonio (or Rodeo de las Aguas)	María Rita Valdez	4,449.31	June 27, 1871
Cienegas, Las	J. Ávila et al.	4,439.05	June 15, 1871
Cienega o Paso de la Tijera	T. Sánchez et al.	4,481.05	May 22, 1873
Ballona, La	A. Machado et al.	13,919.90	December 8, 1873
Brea, La	A. J. Rocha et al.	4,439.07	April 15, 1873

The identity and date of the original 1840s grantee of Aguaje de la Centinela are **Contested-Unresolved**: an 1880 county history states the rancho was granted to Bruno Ávila on September 14, 1844 and patented to the same party (1880 History of Los Angeles County, Ballona Township transcription), while an

attribution to Ygnacio Machado circulates in derivative literature. *[High | Low]* For Rancho La Ballona, an archival finding aid corroborates the 1839 Mexican confirmation to the Machado and Talamantes families (Online Archive of California). *[Supported; Moderate | Moderate]* The rancho partition, land-classification, and public-trust litigation record is a separate research subject and is cross-referenced only (§8.5), to preserve the report's scope.

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4. Historical Spring Inventory and Distribution

4.1 The Inventory Figure and Why It Is a Range

This report uses "approximately 40–45 mapped spring features" for the 1850–1890 period. *[Supported with Qualification; High | Moderate]* Three figures appear in the controlling record, and their relationship is best described as nested or partial registers with an unresolved internal mapping rather than as three competing watershed totals:

1. **45**: TR 671's executive summary states that 70% of the 45 mapped springs in the watershed were found in the Santa Monica Mountain foothills, for a target period the report identifies as the post-migration interval 1850–1890 (TR 671).
2. **29 foothill + 11 valley = 40**: TR 671's regional results state that the Santa Monica Mountain foothills region is dominated by approximately 97 miles of intermittent channels and 29 springs, and that eleven springs were mapped within the Ballona Valley region (TR 671). This sum is a **partial enumeration and a floor**, not a competing total: the report organizes four analysis regions, Ballona Valley, Ballona Lagoon, Santa Monica Mountain Foothills, and La Cienega, states counts for only two of them, and treats the key hydrologic features Ballona Creek and Centinela Creek separately from the regional scheme, which places Centinela Springs itself outside the regional counts.
3. **At least 41**: TR 683 refers to at least 41 natural springs mapped in the Ballona Creek watershed prior to development, citing the historical-ecology study (TR 683). The phrase is explicitly a floor and nests within 45.

Source	Value	Meaning
TR 671 executive summary	45	Watershed-wide statement, 70% attributed to the foothills
TR 671 regional tables	40 (29 + 11)	Partial regional enumeration; two of four regions, Centinela excluded
TR 683	At least 41	Lower bound cited from the historical-ecology study

The residual discrepancy is therefore narrow and specific: TR 671's executive-summary 45 against TR 683's "at least 41," a four-feature difference with no stated cause. *[Contested-Unresolved; High | Low on any single count]* The published 70% foothill share cannot discriminate between them, since 0.70 × 45 ≈ 31.5 and 29 ÷ 0.70 ≈ 41.4 both close within rounding. The 70% figure is accordingly reported here as TR 671's own statement rather than as a reconciled calculation. *[Supported as a source statement; High | Moderate]*

The "32 foothill / 13 valley" split that circulated in earlier accounts is Not Established and does not appear in this edition. *[High | High]* Neither string appears in TR 671; the pair is a back-calculation

from the 70% share applied to 45, not a source count. For the same reason, "approximately 13 Ballona Valley springs" is **Corrected** to the source's eleven.

Two limits travel with any inventory figure. The spring layer was compiled primarily from Hall's 1888 irrigation maps, so the SCCWRP count is not independent of Hall; and TR 671 notes that some mapped features, notably certain ponds and springs, were documented by only one source (TR 671).

4.2 Distribution

Mapped foothill springs clustered along the Santa Monica Mountain front and, in TR 671's words, "stopped abruptly at Franklin Canyon"; the report also records the absence of springs along the **western** section of the foothill region, and offers fault displacement or geologic composition as candidate causes, expressly as hypothesis rather than finding (TR 671). *[Supported for the mapping observation;* `High | Moderate`*]* Earlier framings asserting that no springs occurred *east* of Franklin Canyon invert the source's geography and are **Corrected**.

Hall's independent description of the same landscape identifies two belts of cienega-type sources. In the verbatim text, in several depressions or arroyos of the Santa Monica plain and at the footing of that plain against the Centinela hills there are "a number of little water-sources of the class called cienegas," referred to in the report also as cienega springs and sometimes as artesian springs; "a belt of these sources in the ranchos La Brea, Rodeo de los Aguas, and Santa Monica, is found one to three miles out from the mountain's base, and nearly half way down the plain; and another belt lies immediately at the footing of the plain, against the Centinela hills, and in the ranchos La Cienega, Paso de la Tejera, Rincon de las Bueyes, and La Ballona" (Hall 1888). *[Supported;* `High | High`*]*

- **Upper belt**: La Brea, Rodeo de los Aguas, and Santa Monica ranchos, one to three miles from the mountain's base.
- **Lower belt**: La Cienega, Paso de la Tejera, Rincon de las Bueyes, and La Ballona ranchos, at the footing of the plain against the Centinela hills.

The upper-belt and lower-belt structure organizes the spring profiles in §5.

Regional wetland context, which is not a spring count: TR 671 maps the La Cienega region at 7,012 acres of wetland in 66 polygons, dominated by alkali meadow, with alkali flat and valley freshwater marsh next, while tabulating no springs for that region, and maps the Ballona Valley region at 5,327 acres in 44 polygons including twelve vernal pools, noting that most valley springs were not coincident with other wetland features though often in close proximity (TR 671). *[Supported;* `High | Moderate`*]* The absence of tabulated springs in the La Cienega region coexists with Hall's positive description of cienega sources in those same ranchos; the reconciliation of the two is not stated in either source and is **Contested-Unresolved** as an inventory question. *[*`High | Low`*]*

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5. Spring Profiles

Each profile uses the same fields. `n.a.` means no controlling source supplies the value; it does not mean zero, and it does not license an estimate.

5.1 Kuruvungna Village Springs (Serra Springs)

Field	Entry
Location / setting	1439 South Barrington Avenue, on the grounds of University High School, Los Angeles Unified School District property; approximately two acres with ponds, gardens, and a cultural center (Santa Monica Conservancy; Fowler Museum at UCLA)
Designation	California Historical Landmark No. 522, "Serra Springs," registered November 1, 1954 (Office of Historic Preservation)
Site composition	Municipal record describes "three large springs" (Los Angeles City Clerk); the state landmark record refers to a single spring (Office of Historic Preservation)
Historical discharge	`n.a.` *[Not Established]*
Dated observation 1	22,000–25,000 gallons per day (about 15–17 gallons per minute), stated in a City of Los Angeles Council motion dated May 17, 2005; measurement method not stated (Los Angeles City Clerk). Corroborated in 2020 reporting at roughly 22,000 gallons per day (Alta Journal) *[Reported observation; `High`	`Moderate`]*
Later flow claim	A circa-2023 claim of approximately 56,000 gallons per day, attributed to a timed-volume observation of one spring, could not be traced to a published source. The foundation's site supplies no flow figure (Gabrielino/Tongva Springs Foundation). The claim is excluded from the findings. *[Insufficient Evidence; `Low`	`Low`]*
2026 discharge	`n.a.` *[Insufficient Evidence]*
Flowing status, 2026	Described as a living natural spring in a January 2026 institutional listing (Fowler Museum at UCLA) *[Supported with Qualification; `High`	`Moderate`]*
Tenure / lease status	The original 21-year, one-dollar-per-year district lease is reported to have expired, with the foundation holding the site on a renewable annual lease as of 2020 reporting and a longer-term agreement unresolved (Alta Journal); the foundation's own account states only that it maintains the site under a lease agreement with the high school and the district, without a term (Gabrielino/Tongva Springs Foundation). Status as of 2026: `n.a.` *[Corrected; `Moderate`	`Low`]*
Public access	Reported as the first Saturday of each month, 10 a.m. to 3 p.m. (Santa Monica Conservancy) *[Supported with Qualification; hours should be reconfirmed before reliance]*
Name	Glossed in the municipal record as "a place where we are in the sun" (Los Angeles City Clerk) *[Supported; `High`	`Moderate`]*

Nineteenth-century context is qualitative only. Hall records that "the Santa Monica cienega is developed and piped for the supply of the town of Santa Monica, and this is the largest development or utilization of this sub-group of sources," while characterizing the upper-belt output generally as small (Hall 1888); the 2005 municipal record states that in the late 1800s the springs fed into the water supply of the City of

Santa Monica (Los Angeles City Clerk). *[Supported; High | Moderate]* Neither yields a historical discharge figure.

Excluded or unverified claims. The following do not appear as findings in this edition, and are gathered here rather than scattered through the profile above so that what is excluded, and why, is visible in one place:

- The 2005 published observation is not merged with the unverified later claim. *[Ruling]* The 2005 figure is a site-level statement in a legislative record. The circa-2023 figure lacks a traceable publication and cannot serve as evidence.
- A combined "22,000–56,000 gallons per day" range, and any assertion that historical and current flows at the site were identical, appear in no source and are **Not Established**.
- Named sub-features that appeared in earlier accounts, a "Main Spring Group," an "Athletic Field Spring," and a "Texas Avenue Spring" said to have gone dry in the 1940s, are **Insufficient Evidence**; no source obtained for this review names them or dates any such cessation.
- The archaeological site trinomial sometimes attached to the site is `n.a.` pending confirmation from an authorized repository.

5.2 Centinela Springs

Field	Entry
Location / setting	Centinela Park, 700 Warren Lane, Inglewood; at the footing of the Santa Monica plain against the Centinela hills (Office of Historic Preservation; Hall 1888)
Designation	California Historical Landmark No. 363, "Centinela Springs," date registered October 9, 1939 (Office of Historic Preservation)
Hydrologic role	Origin of Centinela Creek, one of the watershed's two historically perennial streams, described as spring-fed and approximately 4.5 miles long (TR 671)
Natural historical flow	20–30 Hall inches = **0.40–0.60 cfs ≈ 259,000–388,000 gallons per day** (Hall 1888; conversion at Appendix C, C.3) *[Reported Historical Observation + Derived Arithmetic; `High	Moderate`]*
Developed flow	"Something over fifty inches" = **more than 1.0 cfs ≈ more than 646,000 gallons per day**, reflecting works undertaken by the 1880s (Hall 1888) *[Reported Historical Observation + Derived Arithmetic; `High	Moderate`]*
Current flow	`n.a.`; no natural surface discharge at the site *[Insufficient Evidence for a value; Supported with Qualification for the absence]*
Cessation date	**Not Established**

Hall's passage, quoted verbatim because every later account of this site derives from it: "The springs naturally flowed twenty to thirty miner's inches, and have recently been developed to yield something over fifty inches, as explained elsewhere. These waters were, for a number of years, utilized in a comparatively rude fashion in the irrigation of a mixed orchard, containing about one hundred and forty acres, near a mile away, and to which they were led in a little earthen ditch. Now they are piped into a

reservoir and in part pumped to a higher reservoir for the service, under pressure, of the town of Inglewood" (Hall 1888). *[Supported; `High | High` as to the text]*

Two boundaries are essential. First, **the natural-flow figure is the 20–30 inch value only.** The "over fifty inches" yield postdates development works, and later well development at the property is excluded from natural flow altogether (§6.4). Second, **the 1939 landmark registration does not establish that the springs ceased flowing in 1939.** *[Corrected; `High | High`]* The landmark text is retrospective, it records that bubbling springs "once flowed here" from a source in a deep water basin, and a registration date is not a cessation date (Office of Historic Preservation). A secondary local-history account states that by the 1930s the springs were no longer robust enough to reach the surface (Daily Breeze) *[Tier 2; `High | Low`]*. The defensible formulation is that there is no natural surface discharge at the site today and that no primary record obtained for this review dates the cessation. Characterizations such as "definitively extinct since the 1930s–1940s" are **Not Established**.

Groundwater Context

Groundwater-level context for the site is dated and partly unverified: contemporary accounts report a local water level roughly 150 feet below the surface by 1936, and a 1938 local history is reported to give 160 feet with a decline of about four feet per year. *[1936 figure: Supported with Qualification, `Moderate | Moderate`, secondary corroboration at Daily Breeze; 1938 pair: Insufficient Evidence, `Low | Low`, the volume not examined]*

Site commemoration: separate plaque texts dated March 2, 1939 and October 9, 1976 are reported for the park, and a plaque-design attribution circulates in derivative accounts. *[Insufficient Evidence]* A "1970 landmark dedication" appearing in an earlier draft is **Corrected** to the official registration date of October 9, 1939 (Office of Historic Preservation).

5.3 Rodeo de las Aguas and the Foothill (Upper-Belt) Springs

Field	Entry
Setting	Upper cienega belt, one to three miles out from the mountain base, in the ranchos La Brea, Rodeo de los Aguas, and Santa Monica (Hall 1888)
Character	TR 671 describes the area known as the "Rodeo de Las Aguas" or "Round-up of the Waters," where streams ran down from the Santa Monica foothills and converged "each rainy season in a broad swamp or cienega" (TR 671)
Hydrologic role	Hall: "Out from the central springs of the upper belt, on the ranchos La Brea and Rodeo de las Aguas, Ballona creek gathers its upper perennial waters" (Hall 1888)
Historical flow	`n.a.` *[Not Established]*
Current flow	`n.a.` *[Insufficient Evidence]*

[Supported qualitatively; `High | Moderate`] The convergence language in TR 671 is explicitly **seasonal**, tied to the rainy season, and should not be read as a description of perennial marsh maintained by spring discharge. Hall's separate statement that the creek gathered perennial waters from the upper-belt springs is a distinct claim about baseflow origin, and neither statement carries a discharge quantity.

TR 671 also states, twice, that many of the mapped springs persist today and are unique remnant features from the historical landscape (TR 671). *[Supported as a source statement; `High | Moderate`]* That statement is qualitative, is dated to 2011, and supports no count and no discharge value.

5.4 La Cienega and Paso de la Tijera Cienega Springs

Field	Entry
Setting	Lower cienega belt, immediately at the footing of the plain against the Centinela hills, in the ranchos La Cienega, Paso de la Tejera, Rincon de las Bueyes, and La Ballona (Hall 1888)
Hydrologic role	Hall describes Ballona Creek as "reinforced by a little stream from the east, draining the springs of the ranchos La Cienega and Paso de la Tejera" (Hall 1888)
Regional wetland extent	7,012 acres in 66 polygons mapped for the La Cienega region, with no springs tabulated for that region (TR 671)
Historical flow	`n.a.` *[Not Established]*
Current flow	`n.a.` *[Insufficient Evidence]*

[Supported qualitatively; `High | Moderate`] The mismatch between Hall's positive description of cienega sources in these ranchos and TR 671's zero tabulated springs for the La Cienega region is recorded in §4.2 as an unresolved inventory question.

5.5 La Brea Springs

Field	Entry
Setting	Upper cienega belt; Hall treats "La Brea and Santa Monica Springs" together (Hall 1888)
Source characterization	"The waters of the upper belt of springs are not utilized to any extent in irrigation; in fact, the output is quite small, and the demand for domestic supply and garden waterings will probably preclude the spread of irrigation" (Hall 1888)
Historical flow	`n.a.` *[Not Established]*
Current flow	`n.a.` *[Insufficient Evidence]*

[Supported for the characterization; `High | High` as to the text] A La Brea discharge of 200,000–400,000 gallons per day, published in an earlier draft, appears in no source and is in direct tension with Hall's own characterization of upper-belt output as small. It is **Not Established** and does not appear in this edition. The profile is retained because the site is a distinct named entity in Hall's spring-belt geography, not because a flow value exists for it.

5.6 Ballona Valley Spring Features

Field	Entry
Count	**Eleven** springs mapped within the Ballona Valley region (TR 671) *[Corrected from "approximately 13"; `High	High`]*

Field	Entry
Landscape association	Most valley springs were not coincident with other mapped wetland features, though often in close proximity; the region's 5,327 mapped wetland acres in 44 polygons include twelve vernal pools (TR 671)
Documented use	TR 671 records the use of one valley spring for aquaculture, illustrated in the report's figures (TR 671)
Historical flow	`n.a.` *[Not Established]*
Current flow	`n.a.` *[Insufficient Evidence]*

[Supported; `High | Moderate`*]* Valley features are the least individually documented class in the inventory: they are counted and located but not named, gauged, or profiled in the controlling record. This limited treatment reflects the limited detail contained in the controlling record rather than editorial omission.

5.7 Coldwater Canyon and Benedict Canyon

Field	Entry
Documentary status	Hall lists "Nichols, Kimball, and Coldwater Cañons" and "Levering, Benedict, and Beach Cañons" among Cahuenga Cañon utilizations, then states that an account of these was set aside to shorten the publication (Hall 1888)
Historical flow	`n.a.` *[Not Established]*
Current flow	`n.a.` *[Insufficient Evidence]*
Engineering	The Benedict Canyon system channels, including the Higgins and Coldwater Canyon channels, were built between December 1962 and January 1964 (Los Angeles County Public Works) *[Supported;* `High	High`*]*

A caution on identification: Hall's indexed discussions of a "Coldwater canon" that carry quantities refer to a Temescal tributary in Riverside County, a different canyon of the same name, and must not be transferred to the Santa Monica Mountains feature (Hall 1888). *[Corrected;* `High | High`*]* No discharge figure for the Santa Monica Mountains Coldwater Canyon appears in Hall's account.

5.8 Engineered and Non-Spring Comparison Sites

These sites are included specifically because earlier accounts treated them as natural springs. Each is presented as a contrast case.

Franklin Canyon. The park's managing agency records that in 1914 William Mulholland and the Los Angeles Department of Water and Power began construction of a reservoir in upper Franklin Canyon to distribute water newly brought from the Owens Valley; the park comprises 605 acres and contains a three-acre lake, and the agency's account makes no mention of springs. The National Park Service purchased the Franklin Canyon Ranch in 1981 as part of the Santa Monica Mountains National Recreation Area, the Mountains Recreation and Conservation Authority manages daily park operations, and the water utility retains infrastructure interests at the site (Mountains Recreation and Conservation Authority). *[Corrected;* `High | High`*]* Spring contribution to the lake: `n.a.` *[Not Established]* Any claim that springs maintain

the lake through dry seasons, or a Franklin Canyon discharge of 75,000–100,000 gallons per day, is **Not Established** and does not appear here. The canyon retains hydrologic significance for a different reason: it is the eastern limit at which TR 671's mapped foothill springs stop abruptly (§4.2).

UCLA Mildred E. Mathias Botanical Garden. The garden's stream is an engineered, recirculating water feature, not a natural spring. *[Corrected; `High | High`]* The garden's own account describes renewal of the recirculating stream created in the 1970s and of a minimal irrigation system built in the 1950s; the stream is now part of the irrigation system, no longer leaks, and drains to a new capture pond (UCLA Mathias Botanical Garden). The project was funded in part by a $1.5 million gift (UCLA Newsroom); the garden reported that the stream had previously been losing the equivalent of 200 swimming pools of water each year and set completion for June 2024 (UCLA Mathias Botanical Garden), and the garden reports construction complete with all areas open (UCLA Mathias Botanical Garden). *[Supported for engineering history; `High | High`]* Spring discharge: `n.a.` *[Not Established]* A storm drain constructed beneath the arroyo in the 1960s preceded the recirculating stream.

Ballona Freshwater Marsh (cross-reference only). The 26-acre freshwater marsh in the Ballona lowlands was constructed between 2001 and 2003 as a mitigation site, treats urban runoff and stormwater, and receives treated groundwater pumped from the Ballona aquifer and Bellflower aquitard; it forms a 26.1-acre component of a 51.1-acre engineered system that includes a 25-acre riparian corridor, and because it is a managed ecosystem that would not exist without surface-water flows in Centinela Creek, no natural communities commonly associated with groundwater were identified within it in the state's mapping database (Santa Monica Groundwater Subbasin plan; Urban Coast case study). *[Supported; `High | High`]* It is engineered infrastructure, not a natural spring, and it is referenced here only to prevent that conflation.

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6. Historical Flow Evidence and Unit Conventions

6.1 Hall's Convention Is Definitional, Not Inferred

Hall states the unit rule for his own volume: measures of water volumes are given in inches rather than cubic feet per second, and although the inch as measured was not everywhere the same throughout southern California, "when not otherwise specially stated, the inch herein meant is the equivalent of the fiftieth part of a cubic foot per second, in quantity" (Hall 1888). *[Supported; `High | High`]* The same volume applies that convention twice in running text, equating 100 to 200 miner's inches with two to four cubic feet per second, and describing zanja heads of four cubic feet per second as equal to two hundred inches.

Therefore, for Hall's data: 1 inch = 1/50 cfs = 0.02 cfs ≈ 8.98 gallons per minute ≈ 12,926 gallons per day. *[Derived Arithmetic; `High | High`]* Arithmetic at Appendix C, C.2.

Two qualifications belong with the convention. Hall himself observes that the measured inch varied by locality, so the convention is his reporting standard rather than a claim about uniform field practice. And the convention is established here **solely** from Hall's own text; a nineteenth-century newspaper equivalence formerly used as an external cross-check is not relied upon (§6.4).

6.2 The Statutory California Miner's Inch Is a Different Unit

California's statutory standard miner's inch is one and one-half cubic feet of water per minute, measured through any aperture or orifice (California Water Code § 24). *[Supported; `High | High`]* That is 0.025

cfs, equivalently **one-fortieth** of a cubic foot per second, against Hall's one-fiftieth, or 11.22 gallons per minute, or 16,157 gallons per day, approximately 25% larger than Hall's inch (Appendix C, C.1).

The statutory unit is not applied to Hall's figures in this report. *[Ruling]* Doing so inflates every Hall-derived value by 25%. The statutory conversion of Centinela's figures is shown in Appendix C, C.4 for transparency and comparison only. Any figure of the form "1 miner's inch = 11.22 gallons per minute = 13,454 gallons per day," which circulated in an earlier draft, is internally inconsistent: 13,454 gallons per day corresponds to 9.34 gallons per minute; the pairing is **Corrected**.

6.3 Centinela Springs Conversions (Hall Convention)

Hall's figure	cfs (cubic feet per second)	gallons per minute	gallons per day
Natural, 20 inches	0.40	179.5	≈258,500
Natural, 30 inches	0.60	269.3	≈387,800
Developed, ">fifty inches"	>1.00	>448.8	>646,300

[Derived Arithmetic on a Reported Historical Observation; `High | Moderate`*]* Rounded for use: natural 259,000–388,000 gallons per day; developed more than 646,000 gallons per day (Hall 1888; Appendix C, C.3). Truth confidence is Moderate rather than High because Hall reports no measurement method, no date of observation, and no error bound for the natural-flow figure.

6.4 Records That Cannot Bear Weight

The following items appear in the literature of this subject and are recorded here with their disposition, so that later editors do not reintroduce them.

Item	Disposition	Reason
An 1890 report to Congress said to give a Centinela daily capacity of "900,000"	**Insufficient Evidence**	The underlying document was not obtained; the transmitted text explicitly notes that no unit was listed, and its only traceable origin is a tertiary aggregator. It may never be rendered as gallons per day.
An 1895 notice reporting that a landowner had completed two wells and that "one hundred inches" was then flowing at Centinela	**Not Established as spring flow**	The passage describes **artesian well development**, not natural spring discharge, and no publication, date, or page has been verified. Excluded from every natural-flow series in this report.
A 1901 insurance-yearbook waterworks line giving a 500,000-gallon reservoir and 1,250,000 gallons per day of pump capacity	**Not Established as spring flow**	Describes pumping and reservoir plant capacity, not discharge; citation unverified.
A 1904 newspaper passage quoted in TR 671 describing Centinela Creek as carrying "over 75 miner's inches of water (3 acre feet/day)"	**Insufficient Evidence (source untraceable per the report's own corrigenda)**	The April 20, 2026 author corrigenda appended to the currently served SCCWRP TR 671 PDF states that two Los Angeles Times citations, of 1873 and 1904, are not found in the literature cited and had not been confirmed (TR 671, with author corrigenda). The implied equivalence of about 13,000

Item	Disposition	Reason
		gallons per day per inch is recorded for completeness only and is **not** used to corroborate Hall's convention, which is established from Hall's own definitional statement.
A 1938 local history reporting a 160-foot water level and a four-foot annual decline at Inglewood	**Insufficient Evidence**	Volume not examined.

Two general prohibitions follow from this table. Nineteenth- and early-twentieth-century **plant, reservoir, and well capacities are not spring discharges**, and mixing them into a flow series inflates it without evidence. And a figure whose only traceable origin is a tertiary aggregator cannot be promoted by repetition, however many later accounts contain it, the source-independence warning applies with full force to this cluster of Centinela values.

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7. The 2011 Field Investigation and Water-Balance Modeling

7.1 What the Field Campaign Found

SCCWRP measured spring discharge at accessible features in the watershed during the 2011 dry season, using an electronic flow meter where possible and a timed-volume bag test otherwise. Twenty-nine spring features were identified and classified by whether the measurement point was at a natural or a diverted source: **6 natural springs** were found in undeveloped parks along the urban fringe, **17** appeared to be diverted from their source through pipes and culverts, and the remaining **6** were unmeasured because of access issues including unsafe terrain, private property, grates, and intermittency. The located features covered approximately **20%** of the total watershed area (TR 683). *[Corrected;* `High | High`*]*

These were not "29 active springs." *[Ruling]* The source does not use "active" of them, and the majority of the located features were diverted rather than free-flowing. Nor is 29 a census: the report states that it was impossible to find all springs, whether intermittent or perennial, and that only a subset of potential springs was sampled (TR 683). Twenty-nine is a **detection floor under access constraints**, just as the mapped historical counts are enumeration floors (§4.1). The 20% figure is a statement about spatial coverage of the sampling, not about the share of springs found.

7.2 The Measured Rate: 0.00057 m³/s Is a Per-Spring Average

The average per-spring flow rate measured in July 2011 was 0.00057 m³/s (0.02 cfs), equivalent to approximately 13,000 gallons per day per measured spring (TR 683).[^agg] *[Corrected; Observed/Measured with Derived Arithmetic;* `High | Moderate`*]*

[^agg]: TR 683's abstract describes this same value as an "aggregated" flow rate for the 29 features located, while the report's body describes it as the average rate. **The abstract's characterization is internally erroneous.** The report's own arithmetic reproduces only on the per-spring reading, and it does so in four separately printed places: the July 2011 monthly depth of 0.13 mm for 20 assumed-flowing springs, and Table 3's annual depths of 1.55, 1.76, and 1.93 mm for 20, 23, and 25 springs respectively. On the aggregate reading, each of those printed quantities is too small by a factor of about 20 (Appendix

C, C.6). The aggregate reading is therefore recorded as a single-word erratum, not offered as a live alternative interpretation, and "13,000 gallons per day total" is not published in this edition.

Truth confidence is Moderate rather than High because TR 683 does not state how many features the average was computed from, nor the composition of that sample, and because the campaign was a single dry-season pass.

7.3 The Modeled July 2011 Aggregate

Modeled July 2011 aggregate under TR 683's 20-spring assumption: approximately 0.0114 m³/s (0.40 cfs, or about 260,000 gallons per day). *[Modeled/Scenario-Dependent; `High | Low`]* The construction is explicit in the source: assuming there were 20 natural springs flowing at the average rate measured in July 2011, a monthly depth of 0.13 mm over the gauged area follows (TR 683; arithmetic at Appendix C, C.6).

Four constraints travel with this figure wherever it appears:

1. **It is not a measured aggregate.** It is an assumed count multiplied by an average of undisclosed sample composition.
2. **The 20-spring anchor has no stated derivation in the report,** and it matches none of the report's field quantities, not 6 natural springs, not 17 piped or culverted features, not the 23 measurable subtotal, not the 29 located features. Table 3's own explanatory note states that spring counts were calculated as directly proportional to the impervious-free fraction of the watershed; applied forward from 41 predevelopment springs that rule yields roughly 26.7, 30.3, and 33.2 for 2011, 1956, and 1939 against the printed 20, 23, and 25, whereas the same proportional scaling anchored on a 2011 value of 20 reproduces the printed row almost exactly (Appendix C, C.13). The table is anchored on 20 and scaled backward; the origin of 20 is not documented.
3. **It describes July 2011 and is not a current or 2026 value.**
4. **It inherits the report's stated uncertainty**, which TR 683 gives as "likely up to 100%" for its estimate of native water in the system based on its spring measurements (TR 683).

This figure may not be summed with, or compared additively to, the Kuruvungna observations in §5.1, because the published record does not state whether Kuruvungna was among the sampled features. No total in this report is formed by adding values of different dates, methods, or scopes.

7.4 The 2% and 0.5% Partitions

For **July 2011**, a month in which no precipitation was recorded in the watershed and therefore no direct storm runoff occurred, SCCWRP estimated that natural springs supplied about **2% of Ballona Creek runoff**, attributing the remaining 98% by deduction to imported water, excess landscape irrigation, and other human activity (TR 683). *[Supported with Qualification; Modeled/Scenario-Dependent; `High | Low`]*

Scaled across a full year on the assumption that dry-season rates represent annual rates, the modeled spring share of **total annual runoff** falls to about **0.5%**, which the source describes as a baseflow contribution (TR 683). *[Supported with Qualification; `High | Low`]*

Qualifications that must appear adjacent to both numbers:

- Both are **modeled source-partition estimates**, resting on the July 2011 measurements, on the assumed count of 20 flowing springs, and on dry-season sampling of a subset of the watershed's features. Neither is a measured share of all creek flow, and neither is a formal hydrograph-separated baseflow.

- The **98% is not "urban stormwater."** In a month with no recorded precipitation, the residual was attributed by deduction to non-native, imported-water and human sources. Framing it as stormwater misstates both the mechanism and the season.
- SCCWRP characterizes its estimate as conservative, because only a subset of potential springs was sampled and higher spring rates are expected after storms, and it states that uncertainty in its native-water estimate is "likely up to 100%" (TR 683).
- The annual figure is **reproducible from the study's own tables**, Table 3's 2011 row gives 1.55 mm of 294 mm runoff, or 0.53%, while the monthly 2% rests on a single computation (Appendix C, C.8). The annual figure is thus the better-supported of the two.
- Neither figure is used in this edition as a premise for any statement about collapse, and neither supports a watershed-wide percentage decline.
- Neither figure has any relationship to the unrelated tidal-inundation percentage sometimes quoted for the downstream reserve (§8.5). The numerical adjacency of those figures is coincidental; they describe different phenomena measured by different studies.

A predevelopment spring share of "10–15%" that appeared in an earlier draft is **Not Established** and is contradicted in direction by the cited source: TR 683's predevelopment row assigns essentially all predevelopment runoff to springs (TR 683).

7.5 The Per-Spring Decline Estimate

TR 683 estimates a predevelopment dry-season rate of 0.59 mm, equivalent in its own text to 0.15 cfs per spring, and states that this indicates a **greater-than-sevenfold decrease** in dry-season flow rates relative to 2011 (TR 683). *[Supported as the source's own estimate; Modeled/Scenario-Dependent;* `High | Low`*]* The ratio reproduces: 0.15 ÷ 0.0201 = 7.45 (Appendix C, C.7).

Three qualifications apply. The predevelopment rate is derived from Hall's 1888 irrigation report and from TR 671's spring count, so it is not independent of the historical record described in §4. The rate is described in the report's text as a **dry-season** rate while being handled arithmetically as an annual depth, an inconsistency discussed in §7.6 that would move the ratio substantially. And the comparison is per spring, not watershed-wide. **This greater-than-sevenfold per-spring dry-season figure is the only decline metric this report publishes.** Percentage declines in watershed discharge, including the 96–99% figures that circulated in earlier accounts, are **Not Established** and are absent from this edition.

7.6 Technical Methods Note: the Predevelopment Water-Balance Scenario

This subsection exists to document a modeling structure, not to publish a value. **No historical watershed discharge figure, no preferred value, no range, and no headline number, is published in this edition.** *[Not Established as a measured or preferred total]*

TR 683 includes a predevelopment row in its water-balance table that assigns essentially all predevelopment runoff to spring sources, using a runoff rate taken from Hall's 1888 irrigation report, a spring count of 41 taken from the historical-ecology mapping, an annual-depth column, and the 231 km² gauged area (TR 683). A watershed discharge figure can be computed from that row, and earlier drafts of this material did so. Four defects make any such output unsuitable for publication:

1. **Dry-season rate treated as an annual depth.** The report's text describes Hall's 24 mm as an average **dry-season** runoff rate, and the table's own note repeats that description, yet the value is filed in an **annual** depth column and the printed per-spring equivalence closes only if the depth is spread

across a full year. Read as a dry-season depth over a half-year interval, the implied rate and any derived total roughly **double**.

2. **Internal inconsistency within the row.** The same row prints a spring depth of 24.2 mm, a total runoff of 29 mm, and a spring contribution of 100%; 24.2 ÷ 29 is about 83%. Choosing between the two depths changes the output by roughly 17%.
3. **Assumed spring count.** The count is inherited from a mapping exercise whose own total is unreconciled between 45 and "at least 41" (§4.1), and the counts in the same table are anchored and scaled rather than derived (§7.3).
4. **Stated uncertainty of up to 100%** on the report's native-water estimates (TR 683).

A further caution about apparent robustness: the two derivation routes through this row, annual depth over area, and per-spring rate times count, agree closely, but they are **algebraically the same statement read twice**, not two independent estimates, so their agreement is not corroboration (Appendix C, C.7).

Accordingly, the predevelopment scenario is described here in structural terms only. It may be cited as SCCWRP's own modeled scenario under stated assumptions. It may not be cited as the historical watershed spring discharge, it may not appear as a key statistic, and no rate or percentage of decline may be computed from it. Clarification from the report's authors on the dry-season-versus-annual treatment, the basis of the 100% contribution against the 24.2 and 29 mm cells, the derivation of the 20-spring anchor, and the sample composition of the July 2011 average is listed as a research priority in §10; two of those four questions are each worth a factor of two on any output.

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8. Transformation, Engineering, and Contemporary Status

8.1 Channelization Chronology

The transformation of the watershed's surface hydrology was sequential, not a single event. The county's official account records that the City of Los Angeles began to straighten portions of Ballona Creek in the **1920s**; that following a 1934 flood the U.S. Army Corps of Engineers, with the Los Angeles County Flood Control District, lined the lower channel with large rocks quarried from Santa Catalina Island and channelized the upper portions in concrete **between 1935 and 1939**; that major tributaries were channelized starting in **1950**, with the Sawtelle-Westwood system built between March 1950 and February 1960, the Centinela Creek channel between **1960 and 1962**, and the Benedict Canyon system channels including the Higgins and Coldwater Canyon channels between **December 1962 and January 1964**; and that between **1959 and 1965** further modifications included dredging silt deposits, raising walls and levees, and grouting the levee facing. The channel's design capacity is given as approximately 71,400 cfs for a 50-year storm (Los Angeles County Public Works). *[Corrected from a single 1935 date;* `High | High`*]*

The relevance to springs is mechanical rather than statistical: the Centinela Creek channel of 1960–1962 replaced the surface course of the watershed's spring-fed perennial stream, and the tributary channels of 1950–1964 occupy the foothill drainages in which the upper-belt springs were mapped. No source obtained for this review quantifies the discharge effect of any individual channel project on any individual spring, and none is asserted here.

8.2 Groundwater and Subsurface Development

Contemporary accounts place the local water table at Inglewood roughly 150 feet below the surface by 1936 (§5.2), which is the only dated water-level evidence in this record bearing directly on a named spring. *[Supported with Qualification;* `Moderate | Moderate`*]*

Oil-field development in the Baldwin Hills began in the same era: commercial production is recorded under the Standard Oil Company of California at 145 barrels per day, with early operators including the Bartolo Oil Company in 1924 and the Associated Oil Company in 1924, the Shell Company of California in 1925, and 206 wells constructed in 1925; drilling in the Baldwin Hills portion of the field is dated to September 1924 (City of Culver City environmental analysis; Inglewood Oil Field operator history). *[Supported with Qualification;* `High | Moderate`*]* A county reference table lists a field named "Inglewood" as discovered in 1948 (Los Angeles Almanac), a nomenclature discrepancy that is flagged and left unresolved. *[Contested-Unresolved;* `High | Low`*]* No source obtained for this review links oil-field development quantitatively to spring discharge, and no such link is asserted.

Aquifer context, cross-referenced: the Ballona aquifer is the stratigraphic equivalent of the Gaspur aquifer and may have been deposited by the Los Angeles River system when it flowed into Santa Monica Bay; its yield is variable and it is not a major source of water supply (USGS Water-Resources Investigations Report 03-4065). The state groundwater plan adds that the Ballona aquifer, also known as the "50-foot Gravel," is Holocene and is not currently used for groundwater supply, and that the Gaspur aquifer underlies much of the coastal plain but not the Santa Monica subbasin (Santa Monica Groundwater Subbasin plan). *[Supported as stratigraphic equivalence only;* `High | High`*]* The two are not the same aquifer body. A predevelopment discharge estimate for the Ballona aquifer is `n.a.` *[Insufficient Evidence]*

8.3 What "Current" Can and Cannot Mean

Current watershed spring discharge: `n.a.` *[Insufficient Evidence]* No post-2011 watershed spring survey was identified in the course of this review. That is a search outcome, not a demonstration that none exists; confirmation from the relevant agencies is a research priority (§10). The consequence is that every watershed-scale statement about present conditions in this subject area rests on a single dry-season field campaign now fifteen years old, plus site-level observation.

It follows that this edition publishes **no 2026 watershed total, no current aggregate, and no percentage decline**. Current-total figures of 25,000–56,000 and 50,000–75,000 gallons per day that appeared in earlier accounts are **Not Established**: neither is published in any source, and the first is a single site's reported range relabeled as a watershed value.

What the record does support about present conditions is categorical rather than quantitative. Five source-defined categories organize it:

Category	Basis	Count	Flow
Major named historical springs	Hall 1888; TR 671	Centinela, Kuruvungna, the Rodeo de las Aguas complex, La Brea, La Cienega belt features	Only Kuruvungna has any contemporary reported figure (§5.1)
Natural springs in undeveloped parks	2011 field campaign	6 (July 2011)	Average per-spring rate only (§7.2)
Discharges apparently diverted through pipes or culverts	2011 field campaign	17 (July 2011)	Included in the measured set; not free-flowing natural discharge

Category	Basis	Count	Flow
Features located but unmeasured for access reasons	2011 field campaign	6 (July 2011)	n.a.
Seeps and cienega-type features mapped but never gauged	TR 671	not separately counted	n.a.

[Supported; High | High] Sources: TR 683; TR 671; Hall 1888.

Two framings must be kept distinct. **Kuruvungna is the only major named spring in the watershed for which a contemporary discharge figure was located**, which is a statement about the discharge record, not about the number of flowing springs. *[Supported as re-scoped; High | Moderate]* Natural springs and seeps persist more widely: the county's watershed plan states that natural springs still exist at various locations in the Santa Monica Mountains and at a few locations on the coastal plain, including the Kuruvungna Springs on the grounds of University High School (Los Angeles County Public Works); TR 671 states twice that many of the mapped springs persist today (TR 671); and the 2011 campaign found six natural springs in undeveloped parks (TR 683). "Only one active spring" as a watershed-wide statement is therefore **Not Established**.

8.4 Site-Specific Contemporary Status

Site	Flowing status	Discharge value	Basis
Kuruvungna	Described as flowing, early 2026	n.a. for 2026; dated observations in §5.1	Fowler Museum at UCLA
Centinela	No natural surface discharge; cessation date not established	n.a.	Office of Historic Preservation
Rodeo de las Aguas / foothill belt	Not determined	n.a.	no controlling measurement
La Cienega belt	Not determined	n.a.	no controlling measurement
La Brea	Not determined	n.a.	no controlling measurement
Ballona Valley features	Not determined	n.a.	no controlling measurement
Coldwater / Benedict canyons	Not determined	n.a.	no controlling measurement
Franklin Canyon lake	Reservoir, not a spring	n.a. for spring contribution	Mountains Recreation and Conservation Authority
UCLA Mathias Botanical Garden stream	Engineered recirculating feature	n.a.	UCLA Mathias Botanical Garden

8.5 Bounded Cross-references and One Explicitly Contested Question

What this section does not do. The cross-references below situate the spring record against reserve-scale wetland, groundwater, and regulatory data for orientation only. None of them is evidence for or against the downstream estuarine-baseline dispute, and none may be used to adjudicate it; that dispute is addressed on its own terms immediately below and nowhere resolved.

The downstream freshwater-versus-tidal dispute is separate from this report's subject and is explicitly contested. *[Contested-Unresolved; `High | Low`]* Two positions are recorded without adjudication. TR 671 states that its data suggest that at most times the low-energy system had only moderate or no tidal influence and was dominated by freshwater inputs from the watershed, with complete closure of the system from the ocean through substantial portions of the year (TR 671). CDFW's current operative position is that the Ballona was historically an estuarine lagoon fed both by freshwater from Ballona Creek and Centinela Creek and by tidal flow from the Pacific, and that restoring the reserve to a freshwater system would not be historically accurate (CDFW Ballona Wetlands Restoration Project; CDFW-hosted geoarchaeological review). **This report concerns specific named freshwater springs and mapped spring features, not the estuarine baseline of the downstream system**, and neither position above may be used to argue the other or to argue anything about spring discharge.

Reserve condition and tidal extent (cross-reference). A CDFW-hosted condition assessment records that only approximately one quarter of the site, 153 acres, is considered wetland habitat, and that of the remaining wetland habitat only approximately 15 acres at the western edge remains tidally influenced (CDFW-hosted condition assessment); CDFW gives the reserve total as 577 acres (CDFW). *[Supported for the 15-acre and 153-acre figures; `High | Moderate`]* **No percentage is computed here.** A 527-acre denominator circulating in adjacent literature could not be traced to a CDFW figure, and the underlying study was not obtained, so the denominator question is **Insufficient Evidence** and no tidal-fraction percentage is published.

Groundwater-dependent ecosystems (cross-reference). The state's natural-communities dataset identifies 37.3 acres of freshwater emergent wetland and freshwater forested shrub or wetland vegetation within the reserve, of which 8.7 acres are in Area A and 25.3 in Area B, with reserve and adjacent coastal-unit ecosystems totaling approximately 39.9 acres in the subbasin; approximately 40 acres of vegetation within the reserve rely on groundwater (Santa Monica Groundwater Subbasin plan). *[Supported; `High | High`]* These are reserve-scale vegetation-classification metrics under a regulatory mapping program. They are **not** a spring inventory, they have no established relationship to the historical spring counts or wetland acreages in §3.3 and §4.1, and they must not be conflated with them. **37.3 acres of GDE vegetation is not 37.3 acres of spring-fed land and does not imply a count of springs.**

Aquifer pumping scale comparison (cross-reference). The only known wells producing from the Ballona aquifer are associated with groundwater-quality remediation at the Playa Vista development, and in the third quarter of 2020 those wells produced approximately 174 acre-feet (Santa Monica Groundwater Subbasin plan). *[Supported; `High | High`]* That is approximately 616,000 gallons per day over the quarter, roughly 2.4 times the modeled July 2011 dry-season spring aggregate of §7.3 (Appendix C, C.12). *[Derived Arithmetic; `High | Moderate`]* The comparison is offered only as a scale illustration, in its remediation context; it is not spring discharge, and no comparison is made to the withheld predevelopment scenario.

Restoration-project regulatory status (cross-reference, dated). A Los Angeles County Superior Court ruling in May 2023 required CDFW to disclose and analyze new flood-control design parameters while rejecting petitioners' challenges to the environmental impact report's analysis of the project as designed; CDFW decertified the report on September 28, 2023 and is revising it per the court order, with updated flood modeling and public input. The agency's page does not state that a revised report has been completed, certified, or released (CDFW). *[Supported for decertification and revision in progress; Insufficient Evidence for any release date; `High | Moderate`]*

Rancho partition and land-title litigation (cross-reference only). The archival and litigation history behind the rancho names in §3.5, nineteenth-century surveys, partition proceedings, land-classification

categories, and later public-trust litigation, is a separate research subject with its own primary record and is deliberately not absorbed into this report.

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9. Ecological, Cultural, and Management Significance

This section is deliberately narrow. Claims about biodiversity, endemism, amphibian or fish assemblages, and migratory-corridor function appeared in earlier accounts without traceable support and are **not** reproduced here; where such claims are absent below, that absence reflects the state of the cited record, not a judgment that the underlying propositions are false.

9.1 Hydrologic and Habitat Significance, as Documented

The documented ecological role of the watershed's springs in the mapping-era record is stream and wetland maintenance. Springs supplied the origin of Centinela Creek, one of only two perennial streams in a network in which approximately 80% of 232 mapped channel miles were intermittent, and TR 671 states that after the Los Angeles River's southward shift, fresh water springs flowing southwest sustained much of the inland marshland of Ballona Creek (TR 671). *[Supported as source statements;* `High | Moderate`*]* In a semi-arid watershed with a long-term mean precipitation of 409 mm/yr and a pronounced dry season (TR 683), perennial sources are of disproportionate ecological consequence; that inference is **Interpretive Synthesis** and is labeled as such rather than sourced.

The mapped historical wetland complex, 174 polygons, 14,149 acres, twelve habitat types, with alkali meadow, wet meadow, and valley freshwater marsh the largest freshwater-associated classes (TR 671), describes the landscape context in which the springs sat. It does **not** describe an acreage supported by spring discharge (§3.3).

9.2 Cultural Significance

Two spring sites in the watershed carry state historical designations: Landmark 522, "Serra Springs," registered November 1, 1954, whose record notes the 1769 Portolá encampment, a reported 1770 mass, the site's later role as the water supply of the town of Santa Monica, and its present occupation by a high-school campus (Office of Historic Preservation); and Landmark 363, "Centinela Springs," registered October 9, 1939 (Office of Historic Preservation). *[Supported;* `High | High`*]*

Kuruvungna is a Tongva ancestral village site and an active cultural site with ponds, gardens, and a cultural center, described in a January 2026 institutional listing as a living natural spring on a two-acre site (Fowler Museum at UCLA), maintained by a Gabrielino/Tongva foundation under a lease arrangement with the school and district (Gabrielino/Tongva Springs Foundation), and open to visitors on the reported first-Saturday schedule (Santa Monica Conservancy). *[Supported;* `High | Moderate`*]* The municipal record documents long-term Tongva use of the springs as a fresh water source and provides the name's gloss (§5.1). Occupation chronology for the wider Ballona is episodic, as set out in §3.4, and should not be described as continuous. Ceremonial and reinterment events at the site reported in earlier drafts could not be confirmed from a source obtained for this review and are `n.a.` *[Insufficient Evidence]*

Any use of this material in a cultural-resource or consultation context should proceed through appropriate tribal review; this report's treatment is documentary and is not a substitute for consultation.

9.3 Management Significance

Three management-relevant facts follow directly from the evidence record rather than from advocacy.

- **The monitoring record is thin and dated.** The only systematic spring field campaign in the controlling record is a single dry-season pass in July 2011 covering approximately 20% of the watershed area, whose authors state that it was impossible to find all springs and that only a subset was sampled (TR 683). No later watershed survey was identified (§8.3). Any management decision that depends on current spring discharge presently depends on data of that vintage.
- **Institutional tenure at the one site with a contemporary discharge record is unresolved.** The original long-term nominal-rent lease at Kuruvungna is reported to have expired, with annual renewal reported as of 2020 and 2026 status `n.a.` (§5.1) (Alta Journal).
- **Regulatory frameworks that touch groundwater-dependent vegetation operate at a different scale from the spring inventory.** The state groundwater plan's natural-communities mapping addresses reserve-scale vegetation acreage, not spring features (§8.5) (Santa Monica Groundwater Subbasin plan). Watershed planning documents, for their part, record that natural springs persist in the Santa Monica Mountains and at a few coastal-plain locations without gauging them (Los Angeles County Public Works). Neither framework currently produces a spring discharge record.

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10. Evidence Gaps and Research Priorities

The gaps below are ordered by how much each would change what can be published.

1. **Author clarification from SCCWRP on four questions.** (a) The relationship between the 45-feature inventory, the "at least 41" figure, and the partial regional counts. (b) Whether 0.00057 m³/s is a per-spring average or an aggregate, given that the abstract and body differ and only the per-spring reading closes arithmetically. (c) Whether Hall's 24 mm rate is treated as a dry-season or an annual depth in the predevelopment row, and the basis of the printed 100% spring contribution against the row's 24.2 mm and 29 mm cells. (d) The derivation of the 20-spring anchor and the sample composition of the July 2011 average, including whether Kuruvungna was among the sampled features (TR 671; TR 683). Questions (c) and (d) are each worth a factor of two on any historical output. The April 2026 corrigenda to TR 671 demonstrates that the correction channel functions.
2. **Agency determination of whether any post-2011 watershed spring survey exists.** Until answered, "none identified in this review" is the strongest available statement and every current-condition claim carries a fifteen-year lag (§8.3).
3. **An instrumented, date-stamped discharge measurement at Kuruvungna**, with method, agency, and the number of springs measured recorded, and the present lease instrument confirmed. Until then the site's flow must be published as dated observations with methods disclosed, never as a range (§5.1).
4. **Primary retrieval of the disputed Centinela records:** the 1890 report to Congress, to settle whether "900,000" denotes gallons per day and capacity or discharge; the 1895 notice, for publication, date, and page; and the 1938 local history pages behind the 160-foot and four-foot-per-year figures, together with the 1936 newspaper article behind the 150-foot figure (§6.4).
5. **The underlying study behind the tidal-extent denominator**, before any tidal-fraction percentage is published for the downstream reserve (§8.5).
6. **Confirmation of archaeological site records and ethnographic glosses** from an authorized repository and an authoritative ethnographic source, for the site trinomial and for the Sa'angna, Guashna, and Pwinukipar name variants (§3.4, §5.1).

7. **The state oil and gas field record for the Inglewood field**, to resolve the 1924-versus-1948 discovery-date discrepancy between operator and municipal accounts and a county reference table (§8.2).
8. **Grant, confirmation, and patent as separate data fields** for Rancho Aguaje de la Centinela, to resolve the contested identity and date of the original Mexican grantee (§3.5).
9. **Any independent nineteenth-century survey evidence not derived from Hall**, since the historical inventory, the historical flow evidence, and the predevelopment modeling all currently share Hall 1888 as an upstream node (§2.5). County surveyor field notes from the 1850s are one such potential line of evidence and remain unverified.

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11. Conclusions

The historical existence, geography, and general character of the Ballona watershed's natural freshwater springs are well supported. Approximately 40–45 spring features were mapped for the 1850–1890 period, concentrated in the Santa Monica Mountain foothills and stopping abruptly at Franklin Canyon, with a smaller set of features on the valley floor and cienega-type sources in two belts across the Santa Monica plain (TR 671; Hall 1888). Two of the watershed's spring systems, Centinela and Kuruvungna, are documented in enough detail to profile individually, and Centinela is the only site with a period natural-flow figure that can be converted under a stated unit convention.

The quantitative record is far weaker than its frequent restatement suggests. One nineteenth-century site has a natural-flow figure. One twenty-first-century field campaign, lasting a single dry-season month and covering about a fifth of the watershed's area, produced one average per-spring rate. One site has two dated, method-incompatible modern observations. Everything beyond that in circulation is modeling, back-calculation, or repetition. The material advance offered by this edition is not a new number but the removal of numbers that were never in the sources: a fabricated foothill-valley split, an aggregate misread from an average, a wetland acreage misattributed to springs, well and plant capacities entered as spring flows, and watershed totals and percentage declines that no source publishes.

Three quantities are properly `n.a.`, and saying so is the report's substantive finding on present conditions: no historical watershed discharge total, no current watershed discharge total, and no defensible watershed-scale rate of decline. There is no historical watershed discharge total that survives its own source's internal inconsistencies. There is no current watershed discharge total, because no post-2011 watershed spring survey was identified in this review. And there is therefore no defensible rate of decline at watershed scale; the only decline metric the record supports is the source's own greater-than-sevenfold estimate for per-spring dry-season rate, itself resting on assumptions that could move it by a factor of two (TR 683).

What the record does establish about transformation is qualitative and sequential: straightening from the 1920s, concrete and rock channelization between 1935 and 1939, tributary channels including the Centinela Creek channel between 1950 and 1964, and further modification through 1965 (Los Angeles County Public Works); groundwater levels well below the surface at Inglewood by the 1930s; and, in 2011, a spring population whose located features were predominantly piped or culverted rather than free-flowing (TR 683). Springs persist, the county's watershed plan and TR 671 both say so, but the watershed's dry-season flow is now overwhelmingly non-native water, on modeled partitions that carry up-to-100% uncertainty.

Finally, the report's scope boundary is a finding in its own right. The specific-springs question and the downstream estuarine-baseline question are distinct, and the second is genuinely contested between SCCWRP's mapping-era interpretation and CDFW's operative restoration position (TR 671; CDFW). Conflating them has been a recurring defect in this literature. Evidence about named upland springs does not settle the estuarine baseline, and the estuarine debate does not license conclusions about spring discharge.

Appendix A: Key Statistics

Only values traceable to a controlling source appear. `n.a.` entries are deliberate.

Statistic	Value	Basis and date	Status	Source
Watershed area	≈130 sq mi; hydrologic analyses on the 231 km² (89 sq mi) gauged area	municipal; 2011 modeling	Supported	Culver City; TR 683
Long-term precipitation	409 mm/yr (WY1938–2010 mean); study-period runoff 204 mm/yr; evapotranspiration ≈393 mm/yr	2011 modeling	Supported	TR 683
Historical mapped springs	**≈40–45 mapped spring features** (executive summary 45; regional partial enumeration 29 foothill + 11 valley; companion report "at least 41")	1850–1890 target period, mapped 2011	Supported with Qualification	TR 671; TR 683
Foothill share of mapped springs	70%, as the source's own statement	2011	Supported as a source statement	TR 671
"32 foothill / 13 valley"	not used	n/a	Not Established	n/a
Historical mapped wetlands	174 polygons, 14,149 acres, ≈5,726 ha, twelve habitat types; not attributed to springs	1850–1890	Corrected	TR 671
Historical channels	232 mi (373 km), ≈80% intermittent; two perennial streams	1850–1890	Supported	TR 671
Centinela Creek, historical	spring-fed, ≈4.5 mi (7.2 km), originating at Centinela Springs	1850–1890	Supported	TR 671
Hall's inch	1 inch = 1/50 cfs = 0.02 cfs ≈ 8.98 gpm ≈ 12,926 gal/day	1888, author's own definition	Supported	Hall 1888

Statistic	Value	Basis and date	Status	Source
Statutory California miner's inch	1.5 ft³/min = 0.025 cfs = 11.22 gpm = 16,157 gal/day (distinct unit; not applied to Hall's data)	statute	Supported	Water Code § 24
Centinela natural flow	20–30 Hall inches = 0.40–0.60 cfs ≈ **259,000–388,000 gal/day**	reported historical observation, 1888	Supported / Derived Arithmetic	Hall 1888
Centinela developed flow	">fifty inches" = >1.0 cfs ≈ **>646,000 gal/day**; excludes later well development	1888	Supported / Derived Arithmetic	Hall 1888
Centinela current flow	**n.a.**; no natural surface discharge; cessation date not established	n/a	Insufficient Evidence	Office of Historic Preservation
Kuruvungna, observation 1	22,000–25,000 gal/day (≈15–17 gpm)	municipal record, May 17, 2005; corroborated 2020	Reported observation	Los Angeles City Clerk; Alta Journal
Kuruvungna, later flow claim	≈56,000 gal/day (≈40 gpm), attributed to one spring; no published source located and the foundation's own site gives no flow figure	attributed to site steward, c. 2023	Insufficient Evidence; excluded	Gabrielino/Tongva Springs Foundation (no flow figure); see §5.1
Kuruvungna, combined range	not used	n/a	Not Established	n/a
Kuruvungna historical flow	**n.a.**	n/a	Not Established	n/a
Kuruvungna 2026 discharge	**n.a.**; site described as flowing, January 2026	n/a	Insufficient Evidence	Fowler Museum at UCLA
Kuruvungna 2026 lease status	**n.a.**	n/a	Insufficient Evidence	Alta Journal; Gabrielino/Tongva Springs Foundation
Landmarks	CHL 363 Centinela Springs, registered 10/9/1939; CHL 522 Serra Springs, registered 11/1/1954	state records	Supported	363; 522
2011 field investigation	29 features located = 6 natural springs in undeveloped parks + 17 apparently piped/culverted + 6 unmeasured; ≈20% of watershed area covered	July 2011	Corrected	TR 683

Statistic	Value	Basis and date	Status	Source
2011 measured rate	0.00057 m^3/s = 0.02 cfs ≈ **13,000 gal/day per spring**, average	July 2011	Corrected	TR 683
2011 modeled aggregate	≈0.0114 m^3/s = 0.40 cfs ≈ **260,000 gal/day**, under a 20-spring assumption; not measured, not current	July 2011	Modeled/Scenario-Dependent	TR 683
Spring share of runoff	≈2% of July 2011 runoff in a month with no recorded precipitation; ≈0.5% annualized; uncertainty up to 100%	July 2011 / annualized	Supported with Qualification	TR 683
Predevelopment spring share of runoff	100% in the source's predevelopment row (assumption, not measurement)	2011 modeling	Supported with Qualification	TR 683
Historical watershed spring discharge	**no value published** (see §7.6)	n/a	Not Established as a measured or preferred total	TR 683
Current watershed spring discharge	**n.a.**	no post-2011 survey identified	Insufficient Evidence	n/a
Percentage decline, watershed	**n.a.**	n/a	Not Established	n/a
Decline metric published	">sevenfold decrease" in per-spring dry-season rate, as the source's own estimate	2011 modeling	Supported as a source statement	TR 683
Runoff ratio	0.07 predevelopment; contemporary endpoint contested within the source (abstract ≈1.0 vs Table 3's 0.61 and 0.77)	2011 modeling	Contested-Unresolved	TR 683
LA River course	discharging into the Ballona as late as 1825; earlier switches undated; earthquake series and three-consecutive-year rains withdrawn	corrigenda-corrected	Corrected / Superseded	TR 671, with author corrigenda; CDFW-hosted review
Channelization	straightening from the 1920s; concrete/rock 1935–1939; tributaries 1950–1964; modifications 1959–1965; design capacity ≈71,400 cfs	county record	Corrected	Los Angeles County Public Works

Statistic	Value	Basis and date	Status	Source
Tongva occupation of the Ballona	onset ≈8,000–7,000 BP; episodic, with a documented gap ≈6,000–4,500 BP; settlement shift ≈1,000 BP; not continuous	geoarchaeological review	Corrected	CDFW-hosted review
Franklin Canyon	605-acre park; 3-acre lake; reservoir begun 1914 for Owens Valley water; NPS acquired the ranch 1981; MRCA operates. Spring contribution **n.a.**	agency record	Corrected	MRCA
La Brea, Coldwater, Benedict, La Cienega, Ballona Valley, Rodeo de las Aguas, UCLA garden flows	**n.a.**	no controlling measurement	Not Established / Insufficient Evidence	Hall 1888; TR 671
Ranchos (context)	Aguaje de la Centinela 2,219.26 ac (patent 8/23/1872); Rodeo de las Aguas 4,449.31 ac (6/27/1871); Las Ciénegas 4,439.05 ac (6/15/1871); Cienega o Paso de la Tijera 4,481.05 ac (5/22/1873); La Ballona 13,919.90 ac (12/8/1873); La Brea 4,439.07 ac (4/15/1873)	State Archives	Supported	California Secretary of State
Cross-reference metrics (not spring data)	reserve total 577 ac; 153 ac delineated wetland; ≈15 ac tidally influenced (no percentage published); 37.3 ac mapped groundwater-dependent vegetation in the reserve; engineered freshwater marsh 26.1 ac within a 51.1-ac system built 2001–2003; ≈174 acre-feet produced from the Ballona aquifer by remediation wells in Q3 2020	agency and plan records	Supported / Insufficient Evidence on the tidal denominator	CDFW-hosted condition assessment; CDFW; Santa Monica Groundwater Subbasin plan; Urban Coast case study
Post-2011 watershed spring survey	**n.a.**, none identified in this review	n/a	Insufficient Evidence	n/a

Appendix B: Claim-Status Summary

#	Claim	Status	Evidence form	Transcription | truth
B1	≈40–45 mapped historical spring features	Supported with Qualification	Reported/mapped	High | Moderate
B2	29 foothill and 11 valley springs as regional counts	Supported	Reported/mapped	High | High
B3	Relationship between 45 and "at least 41"	Contested-Unresolved	n/a	High | Low
B4	32 foothill / 13 valley split	Not Established	Back-calculation	High | n/a
B5	174 polygons, 14,149 acres, ≈5,726 ha, twelve habitat types	Corrected	Mapped	High | High
B6	Springs supported all 14,149 wetland acres	Not Established	n/a	High | n/a
B7	5,470 ha as the metric equivalent of 14,149 acres	Corrected	Derived arithmetic	High | High
B8	Springs stopped abruptly at Franklin Canyon; absence along the western foothills	Supported	Mapped observation	High | Moderate
B9	"No springs east of Franklin Canyon"	Corrected	n/a	High | n/a
B10	Hall's inch = 1/50 cfs for Hall's data	Supported	Author's definition	High | High
B11	Statutory miner's inch = 0.025 cfs = 16,157 gal/day	Supported	Statute	High | High
B12	Centinela natural flow 20–30 inches = 259,000–388,000 gal/day	Supported / Derived Arithmetic	Reported historical observation	High | Moderate
B13	Centinela developed flow >50 inches = >646,000 gal/day	Supported / Derived Arithmetic	Reported historical observation	High | Moderate
B14	1895 100-inch figure as natural spring flow	Not Established	Well development	Low | Low
B15	1890 "900,000" as gallons per day	Insufficient Evidence	Locating lead only	Low | Low

#	Claim	Status	Evidence form	Transcription | truth
B16	1901 reservoir and pump capacities as spring discharge	Not Established	Plant capacity	Low | Low
B17	1904 newspaper equivalence as a conversion anchor	Insufficient Evidence (citation unconfirmed per corrigenda)	Locating lead only	High | Low
B18	Centinela extinction dated to 1939 by landmark registration	Not Established	n/a	High | n/a
B19	No natural surface discharge at Centinela today	Supported with Qualification	Documentary	High | Moderate
B20	29 features located = 6 natural + 17 piped/culverted + 6 unmeasured; ≈20% area coverage	Corrected	Observed	High | High
B21	"29 active springs"	Not Established	n/a	High | n/a
B22	0.00057 m^3/s = average per measured spring, July 2011	Corrected	Observed/Measured	High | Moderate
B23	Abstract's "aggregate" characterization	Corrected (internal erratum)	n/a	High | High
B24	"13,000 gal/day total"	Not Established	n/a	High | n/a
B25	≈260,000 gal/day, July 2011, 20-spring assumption	Modeled/Scenario-Dependent	Modeled	High | Low
B26	20-spring anchor derivation	Not Established (undocumented in source)	n/a	High | Low
B27	≈2% of July 2011 runoff; 98% imported/human sources by deduction	Supported with Qualification	Modeled	High | Low
B28	≈0.5% of annual runoff, annualized	Supported with Qualification	Modeled	High | Low
B29	"98% urban stormwater"	Corrected	n/a	High | n/a
B30	"10–15% predevelopment spring share"	Not Established	n/a	High | n/a
B31	Historical watershed discharge total	Not Established as measured or preferred; no value published	Modeled	High | Low
B32	Current watershed spring discharge	Insufficient Evidence, `n.a.`	n/a	High | n/a

#	Claim	Status	Evidence form	Transcription | truth
B33	96–99% watershed decline	Not Established	n/a	High | n/a
B34	">sevenfold decrease" in per-spring dry-season rate	Supported as a source statement	Modeled	High | Low
B35	Contemporary runoff ratio ≈1.0	Contested-Unresolved	n/a	High | Low
B36	Kuruvungna 22,000–25,000 gal/day, 2005	Supported with Qualification	Reported observation	High | Moderate
B37	Kuruvungna ≈56,000 gal/day, c. 2023, one spring	Insufficient Evidence; excluded	Unpublished attributed claim	Low | Low
B38	Fused Kuruvungna range; historical = current	Not Established	n/a	High | n/a
B39	Kuruvungna flowing, early 2026	Supported with Qualification	Institutional description	High | Moderate
B40	Kuruvungna 2026 discharge and lease status	Insufficient Evidence, n.a.	n/a	High | n/a
B41	Three large springs at the Kuruvungna site	Supported	Municipal record	High | Moderate
B42	Named Kuruvungna sub-features and a 1940s cessation	Insufficient Evidence	n/a	Low | Low
B43	Franklin Canyon lake as a 1914 reservoir for Owens Valley water	Corrected	Agency record	High | High
B44	Franklin Canyon spring contribution and 75,000–100,000 gal/day	Not Established, n.a.	n/a	High | n/a
B45	UCLA garden stream as engineered recirculating feature	Corrected	Institutional record	High | High
B46	La Brea 200,000–400,000 gal/day	Not Established, n.a.	n/a	High | n/a
B47	Coldwater and Benedict canyon flows	Not Established, n.a.	n/a	High | n/a
B48	La Cienega belt and Ballona Valley flows	Not Established, n.a.	n/a	High | n/a
B49	Tongva occupation onset ≈8,000–7,000 BP, episodic, gap ≈6,000–4,500 BP	Corrected	Geoarchaeological synthesis	High | High

#	Claim	Status	Evidence form	Transcription | truth
B50	"8,000 years of continuous occupation"	Not Established	n/a	High | n/a
B51	Crespí wording "roofed with grass"	Corrected	Translated primary text	High | High
B52	Identification of the 1769 camp village with Kuruvungna	Contested-Unresolved	n/a	High | Low
B53	LA River discharging into the Ballona as late as 1825	Corrected	Documentary	High | High
B54	Earthquake series; three consecutive years of heavy rains	Superseded/Withdrawn	n/a	High | n/a
B55	Channelization sequence 1920s–1965	Corrected	Agency record	High | High
B56	Inglewood oil field discovery date	Contested-Unresolved (1924 vs 1948 nomenclature)	n/a	High | Low
B57	Rancho acreages and patent dates	Supported	State Archives	High | High
B58	Original 1840s grantee of Aguaje de la Centinela	Contested-Unresolved	n/a	High | Low
B59	Downstream freshwater-versus-tidal historical baseline	Contested-Unresolved; outside this report's scope	n/a	High | Low
B60	Tidal-fraction percentage for the reserve	Insufficient Evidence (denominator untraced); 15 acres supported	n/a	High | Low
B61	Engineered Ballona Freshwater Marsh as constructed infrastructure	Supported	Plan record	High | High
B62	Ballona aquifer as stratigraphic equivalent of the Gaspur aquifer	Supported (stratigraphic only)	Agency record	High | High
B63	Mission-period demographic figures	Insufficient Evidence, n.a.	n/a	High | n/a
B64	Sa'angna and Pwinukipar glosses	Insufficient Evidence, n.a.	n/a	High | n/a
B65	Biodiversity, endemism, and flyway	Not Established	n/a	High | n/a

#	Claim	Status	Evidence form	Transcription | truth
	claims from earlier drafts			
B66	"Only one active spring" watershed-wide	Not Established; re-scoped to the discharge record	n/a	High | n/a
B67	Many mapped springs persist today	Supported as a source statement	Documentary, 2011	High | Moderate
B68	No post-2011 watershed spring survey identified in this review	Supported as a search outcome	n/a	High | Moderate

Appendix C: Calculation Register

Glossary for this appendix, so it can be read without reference to earlier sections: *Hall inch* is Hall's (1888) own reporting unit, one-fiftieth of a cubic foot per second, distinct from California's statutory miner's inch (§6.1–6.2); *cfs* is cubic feet per second; *gpm* is gallons per minute; *gal/day* is gallons per day; *Derived Arithmetic* denotes a unit conversion or algebraic restatement of a sourced value that adds no new information (full evidence-form definitions at "How to Read This Report," Axis B).

Constants: `1 ft³ = 7.480519 US gal · 1 cfs = 448.831 gpm = 646,317 gal/day · 1 m³ = 264.1721 US gal · 1 m³/s = 35.31467 cfs = 22,824,465 gal/day · 1 acre = 0.4046856 ha · 1 acre-ft = 325,851 US gal · 1 day = 1,440 min = 86,400 s`.

C.1 Statutory California miner's inch. `1.5 ft³/min ÷ 60 = 0.025 cfs`; `0.025 × 448.831 = 11.22 gpm`; `11.22 × 1,440 = 16,157 gal/day`. A stated pairing of 11.22 gpm with 13,454 gal/day is internally inconsistent, since `13,454 ÷ 1,440 = 9.34 gpm`.

C.2 Hall's convention, from Hall's own definition. `1 inch = 1/50 cfs = 0.02 cfs`; `0.02 × 448.831 = 8.977 gpm`; `0.02 × 646,317 = 12,926 gal/day`. Cross-check against Hall's in-text equivalence: `4 cfs ÷ 200 inches = 0.02 cfs per inch`.

C.3 Centinela Springs on Hall's convention. `20 × 0.02 = 0.40 cfs → 179.5 gpm → 258,527 gal/day`; `30 × 0.02 = 0.60 cfs → 269.3 gpm → 387,790 gal/day`; `>50 × 0.02 = >1.00 cfs → >448.8 gpm → >646,317 gal/day`.

C.4 Same figures on the statutory inch (comparison only; not used). `20 × 0.025 = 0.50 cfs → 323,159 gal/day`; `30 × 0.025 = 0.75 cfs → 484,738 gal/day`; `>50 × 0.025 = >1.25 cfs → >807,896 gal/day`. Applying the statutory unit to Hall's figures inflates them by 25%.

C.5 Non-load-bearing period equivalence (recorded, not relied upon). `3 acre-ft/day = 977,553 gal/day`; `977,553 ÷ 75 inches = 13,034 gal/day per inch`; `÷ 646,317 = 0.0202 cfs per inch`. This would corroborate the 1/50 convention, but the underlying newspaper citation is unconfirmed per the TR 671 author corrigenda (§6.4), so the convention rests on Hall's own definition alone.

C.6 Which reading of 0.00057 m³/s closes. Unit conversions: `0.00057 × 22,824,465 = 13,010 gal/day`; `0.00057 ÷ 0.0283168 = 0.0201 cfs`, matching the printed 0.02 cfs. Per-spring reading

tested against the printed July 2011 depth (31 days; 231 km²): 20 × 0.00057 = 0.0114 m³/s; 0.0114 × 2,678,400 s = 30,534 m³; 30,534 ÷ 231,000,000 = 1.322 × 10^{-4} m = 0.132 mm, matching the printed 0.13 mm. Aggregate reading tested: 0.00057 × 2,678,400 = 1,527 m³ ÷ 231 km² = 0.0066 mm, about 20 times too small. Modeled aggregate: 0.0114 m³/s = 0.403 cfs = 260,200 gal/day = 180.7 gpm.

C.7 Per-spring rates and the withheld watershed output. Predevelopment per-spring depth: 24.2 mm ÷ 41 springs = 0.590 mm; spread over 365 days across 231 km², 0.590 mm → 0.1526 cfs, matching the printed 0.15 cfs; spread over 183 days instead, → 0.3044 cfs, twice as large. Decline ratio: 0.15 ÷ 0.0201 = 7.45, consistent with the source's ">sevenfold" statement. The two routes to a watershed-wide predevelopment discharge, annual depth over area, and per-spring rate times count, are algebraically the same statement, since 24.2 ÷ 41 = 0.590 and 0.590 mm over 231 km² over 365 days = 0.1526 cfs; their agreement is therefore not corroboration. **No watershed-wide predevelopment discharge value is published in this edition** (§7.6); the row's dry-season-versus-annual ambiguity alone spans a factor of two, its own cells disagree by 17% (24.2 ÷ 29 = 83% against a printed 100%), and the source's stated native-water uncertainty is up to 100%.

C.8 Annual-share reproducibility. Table 3, 2011 row: 1.55 mm ÷ 294 mm = 0.53%, matching the printed 0.5%. Earlier rows: 1.76 ÷ 185 = 0.95% (printed 1.0%) and 1.93 ÷ 156 = 1.24% (printed 1.2%). The monthly 2% figure has no comparable independent check within the source.

C.9 Acre-to-hectare conversion. 14,149 ac × 0.4046856 = 5,725.9 ha → 5,726 ha, against a printed table total of 5,470 ha. Row audit: 1,284 ac → 519.6 ha (printed 486) and 5,273 ac → 2,133.9 ha (printed 1,915); the residual (519.6 − 486) + (2,133.9 − 1,915) = 252.5 ha accounts for the shortfall. Other rows agree within a few hectares.

C.10 Habitat percentage check. 5,273 ÷ 14,149 = 37.3%; 3,336 ÷ 14,149 = 23.6%; 1,356 ÷ 14,149 = 9.6%; 1,240 ÷ 14,149 = 8.8%; 1,284 ÷ 14,149 = 9.1%. Published percentage shares are approximate; acres should be quoted.

C.11 Kuruvungna arithmetic. 22,000 ÷ 1,440 = 15.3 gpm; 25,000 ÷ 1,440 = 17.4 gpm. The excluded later claim would arithmetically convert as follows if its asserted inputs were accepted: 5 gal ÷ 7.5 s = 0.667 gal/s = 40.0 gpm; × 86,400 s = 57,600 gal/day. Because no published source for those inputs was located, the calculation does not validate the claim. A "15–39 gpm" range also improperly splices the 2005 published lower bound to the unsupported later upper bound; no source states that range.

C.12 Remediation-pumping scale comparison. 174 acre-ft × 325,851 = 56,698,074 gal; ÷ 92 days = 616,283 gal/day = 428 gpm = 0.953 cfs. Against the modeled July 2011 spring aggregate: 616,283 ÷ 260,200 = 2.37×. No comparison is made to the withheld predevelopment scenario.

C.13 Spring-count column audit. The table's note states that counts were calculated as directly proportional to the impervious-free fraction. Applied forward from 41 predevelopment springs, that rule yields approximately 26.7 / 30.3 / 33.2 for 2011 / 1956 / 1939, against printed 20 / 23 / 25. The same proportional scaling anchored on a 2011 value of 20 yields 20.00 / 22.77 / 24.92, reproducing the printed row. The table is therefore anchored on 20 and scaled backward, and the origin of the 20-spring value is not stated in the source.

C.14 Per-spring depth closures across the table. Scaling the July per-spring average across the annual rows reproduces the printed annual depths for 20, 23, and 25 springs to within about 1% (printed 1.55

/ 1.76 / 1.93 mm), which is the four-way closure cited in §7.2. The aggregate reading fails each of these by a factor of about 20.

Appendix D: Corrigenda Compliance, Version Control, and Disclosure

D.1 The April 20, 2026 TR 671 Author Corrigenda

Cited throughout as **author corrigenda dated April 20, 2026, appended to the currently served SCCWRP Technical Report 671 PDF** (TR 671, with author corrigenda). The corrigenda is authored in the names of the original report's authors, is prepended to the served document, acknowledges external review, and describes its corrections as an updated and superseding version of the original report. It is **not** described here as a separately catalogued technical report; the absence of a separate catalogue entry in a publication index is a metadata limitation, not evidence about validity.

Corrigenda item	Effect in this edition
Withdrawal of the "series of earthquakes" explanation for the river's course change	Claim removed entirely; marked Superseded/Withdrawn (§3.2, B54)
Withdrawal of the "three consecutive years of heavy rains" narrative	Claim removed entirely; marked Superseded/Withdrawn (§3.2, B54)
Retention of 1825 heavy rains as supported, associated with the change of course	Retained in that form only (§3.2)
Statement that two Los Angeles Times citations, of 1873 and 1904, are not found in the literature cited and had not been confirmed	The 1904 "over 75 miner's inches" equivalence is recorded as Insufficient Evidence and is not used as a conversion anchor (§6.4, C.5)
Bibliographic corrections, including an author-name spelling correction, correction of the historical topographic-sheet agency to the United States Coast Survey rather than the U.S. Geological Survey, a figure-caption date correction from 1887 to 1888, and a place-of-publication correction	No claim in this edition depends on the uncorrected forms; agency attributions for historical map sources follow the corrected text

Every statement in this report that depends on TR 671 was re-read against the corrigenda, including statements that entered the record through intermediate review documents rather than through the January drafts. A corrigenda applied selectively is itself a citation defect.

D.2 Document Lineage and Superseded Material

Item	Status
This document (Rev. v0.10)	**Controlling working revision.** See the Version History block at the end of this document for semantic-versioning conventions.
"Natural Freshwater Springs of the Ballona Watershed" and "Natural Freshwater Springs of the Ballona Watershed: A Comprehensive Historical and Contemporary Analysis" (two January 2026 drafts)	**Superseded.** Retained as provenance artifacts only; not citable.
Transmittal boilerplates accompanying the January 2026 drafts	**Superseded.**
TARC Evidence Stage Primary-Source Claim Matrix (August 6, 2026 review of the two January drafts)	**Working paper, not part of this report's citation apparatus.** Its claim-by-claim findings are the basis for the corrections

Item	Status
	and deletions recorded in Appendix B and in D.5; it is retained in the project working files rather than reproduced here.
Later supplemental memoranda on engineered-marsh hydrology and on rancho history	**Out of scope as substance; methodology imported.** Their evidence-status vocabulary, transcription-versus-truth distinction, tiered source hierarchy, and period-specific documentary-lineage framing are adopted here (§2, §2.7). Their factual cross-references were verified against the controlling source URLs rather than accepted as transmitted.

Claims removed relative to the superseded drafts are itemized by status in Appendix B; each removed value appears there with its disposition so that no deletion is silent.

D.3 Citation-Retrieval Note

Every citation link in this edition was checked on August 6, 2026. A prior working draft of this report had marked two `filelib.wildlife.ca.gov` documents as unreachable by automated fetch and had routed both citations through the CDFW parent project page as a substitute. On direct re-fetch during this revision, the geoarchaeological review resolved successfully at its original direct URL (CDFW-hosted geoarchaeological review), and that direct link has been restored throughout this edition (§3.2, §3.4, §8.5, Appendix B). The Johnston, Medel and Solek (2015) condition assessment was confirmed present at its original path via the parent directory index (`01_Exec Sum_Refs/Johnston Medel and Solek 2015.pdf`, 1,613,830 bytes, unchanged since 2018) but was not independently re-fetched by document content in this pass; its citation in §8.5 continues to point to The Bay Foundation's content-equivalent 5-Year Monitoring Report (TBF 5-Year Report) pending that direct confirmation. One host, the Los Angeles City Clerk document server, continues to refuse automated requests while serving the same document to ordinary browser retrieval; that citation is retained as-is. Readers encountering an error on any citation link in this edition should retrieve the document through a normal browser session or, for CDFW file-library material, through the parent project page (CDFW Ballona Wetlands Restoration Project).

D.4 Disclosure

Four disclosures are made in the interest of visible seams.

1. **Provenance concentration.** The historical inventory, the historical flow evidence, and the predevelopment modeling in this subject area share two upstream evidence nodes, Hall 1888 and the SCCWRP 2011 pair, with the second partly derived from the first (§2.5). Numerical agreement among downstream sources is not corroboration.
2. **Review-chain non-independence.** The external review acknowledged in the TR 671 corrigenda, the transmittal of the superseded January documents, and the supplemental memoranda whose methodology this edition imports are associated with a single reviewer in the record behind this rebuild. The corrigenda is authored and published by the report's own authors and is treated as controlling on that basis; it is not treated as independent corroboration of positions originating with the same reviewer, and the imported methodology is applied symmetrically, including to the memoranda from which it was drawn.
3. **Pre-publication review status.** Hydrologic and engineering review, historical-source review, and appropriate cultural and tribal review are recommended before any external release of this edition. Nothing in this document constitutes tribal consultation.

4. **Authorship and direction.** This report's thesis, scope, evidentiary standards, and disposition of every open question were set and continuously directed by a single human principal, who also performed production management across the full version history recorded above. Drafting, calculation, and independent review were delegated to and performed by AI systems (Claude, ChatGPT, and Perplexity Computer) under that direction, each check-in and revision decision made by the principal rather than by the systems themselves. Informal references elsewhere in this review record to an AI system as the report's "author" describe a drafting role, not authorship in the ordinary sense; the systems hold no independent editorial authority over this document's content, scope, or conclusions, and did not exercise any.

D.5 Prohibited Formulations

For the benefit of future editors, the following do not appear in this edition and should not be reintroduced without new controlling evidence: historical watershed totals of 3.5–7.5, 2–5, or 4–5 million gallons per day; a headline historical MGD value of any kind; current watershed totals of 25,000–56,000 or 50,000–75,000 gallons per day; watershed percentage declines of 96–99%; "29 active springs"; "13,000 gallons per day total"; "32 foothill / 13 valley"; "approximately 13 Ballona Valley springs"; springs credited with all 14,149 wetland acres; 5,470 hectares as the metric equivalent of that acreage; a single fused Kuruvungna range or an assertion that its historical and current flows were equal; Franklin Canyon at 75,000–100,000 gallons per day; La Brea at 200,000–400,000 gallons per day; the 1895 100-inch well figure, the 1890 "900,000" value, and the 1901 plant capacities as spring discharge; the 1904 newspaper passage as corroboration; "only one active spring" as a watershed-wide fact; eight thousand years of continuous occupation; "roofed with tules"; an unqualified identification of the 1769 camp village with Kuruvungna; the withdrawn earthquake and three-year-rainfall narratives; a tidal-fraction percentage computed on an untraced denominator; and any tertiary aggregator, children's reference page, or artificial-intelligence-generated summary as support for any claim.